ORIENTATION TO OBJECTS BY AFRICAN AMERICAN AND WHITE ADOLESCENTS IN AN INFORMAL SETTING

By

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Abstract of Dissertation Presented to the Graduate School
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Photography was used as a research tool to determine how African American and White adolescents directed their attention in a natural history museum. Attention is of interest because of its importance as the first step in the learning process. Specifically, this study was designed to explore the extent that the attention of seventh grade students is (a) focused on objects and exhibits or other visitors; (b) affected by the exhibit hall topic, exhibit location within the museum, and exhibit type; (c) affected by whether the occasion is a first-time visit or repeat visit to the institution; and (d) affected by gender, race, socio-economic status, general achievement, science achievement, or interest in science.

Chi-square tests of significance indicated significant differences at $\alpha = .05$ in the object or people orientation (Yates Correction for Continuity, df =1), and the exhibit hall topic (df =7), exhibit location (df =2), and exhibit type (df =2). These results are the product of the learning conditions in this informal setting that provide visitors freedom of choice. The students were able to move through the exhibits at their own pace, direct their attention as they wished, and decide what they wanted to photograph depending on how they interpreted the task they were given. The characteristics of the exhibits such as topic, location, type, and size, were also important factors and influenced attention. More than 85% of the photographs taken by the students were of objects, rather than other people, thus clearly confirming the importance of objects for the students during their museum visit. No significant difference was found in the relationship between prior visit/no prior visit and the object/people orientation (Yates Correction for Continuity, df = 1).

Multiple regression was used to determine the object/people relationships among the dependent variable, the photographs taken by the students, and the independent variables, gender, race, SES, general achievement, science achievement, interest, and visit occasion. Significant results at $\alpha = .05$ were found for two of the variables. African American students took more people photographs than did White students while reduced lunch status students took fewer people photographs than students with no lunch assistance. The people orientation may mean that for some members of the audience to be equal recipients of the educational opportunities that objects and exhibits provide in informal settings, it may be critical to provide a link between the person and the object in both exhibits and educational programs.

CHAPTER 1
INTRODUCTION

Museums in the United States are distributed in approximately the same proportion as the population. Thus with 8,200 museums nationwide, there is one museum for every 30,000 Americans. The enormous popularity of museums and the corresponding growth in their numbers during the last half of this century has been remarkable with 75% of the museums founded since 1950 (American Association of Museums, 1994). However, not only have their numbers increased dramatically during this time period, but as institutions, they have changed tremendously.

> Formerly the exclusive bastions of high art and high society, museums large and small have reached out to new audiences, formed new partnerships, and asserted the primacy of their educational mission. They have redefined themselves as institutions of public service and education, combining intellectual rigor with a commitment to include all sectors of society. Open to all, they provide to the poor and to those newly arrived in America an avenue to social advancement and inclusion. (AAM Government Affairs Office, 1993, p. 3)

The Commission on Museums for a New Century was established "to explore current social, economic, political, and scientific trends that will affect the future of museums; to identify trends in the operations and needs of museums; and to describe the resulting opportunities and responsibilities facing the museum community" (Hicks & Munley, 1984, p. 11). The Commission made 16 recommendations; 4 are concerned with education. These 4 recommendations establish the centrality of education to all aspects of museums, the importance of research in finding out how people learn in museums, the value of museum/school collaboration, and the vital role of educational programs for adults (Hicks & Munley, 1984).

Another 4 of the recommendations made by the Commission are concerned with collections, which are the foundation of all museums (Hicks & Munley, 1984). Museums exist to collect, conserve and preserve, and interpret objects. These objects now number nationally some three-quarters of a billion individual objects or specimens and objects counted in lots (AAM, 1994). Most visitors, both those today and those in the past, come to museums to see objects and it is assumed that these objects and the exhibits in which they are contained have the greatest impact on the visitor's museum experience (Falk & Dierking, 1992; Melton, 1935). "Visitors spend most of their time looking at, and presumably thinking about, the objects and labels in exhibits, and leave with images of them. Even though the visitor's physical context can include a multitude of events or features, it is generally assumed that objects and labels have the greatest influence on the visitor's museum experience" (Falk & Dierking, 1992, p. 67).

Thus what visitors pay attention to in museums in terms of the objects and exhibits on display, as well as other aspects of the institution, and how the selection of what they pay attention to is influenced by a variety of factors is critically important not only for the museum visit itself but may have broader implications. Lakota (1975a) wrote, "The visual nature of museum environments also makes them potentially powerful in developing basic skills for acquiring information later in life. . . . The essential observational skills which are prerequisite for effective learning involve the ability to self-direct inspectional activities such that the most important elements in a visual environment are attended to in a way that leads to meaningful perceptions" (p. 113). While describing why people participate in the arts, Orend (1989) affirmed the importance of acquiring information both visually and aurally as well as the critical roles these methods have in our daily lives.

It is noteworthy that the educational goals of today's museums are essentially the same as they were 50 years ago when Nielson (1946) wrote, "The museum must take its visitors as they are--tired, hurried, or uninterested--and seek ways of making their visits, short or long, as fruitful educationally as possible" (p. 110). Yet even though the number of museums has grown significantly during the last half of the 20th Century and the commitment to inclusiveness and education has been made repeatedly, museum visitors are not representative of our society, and our knowledge about how visitors learn is still limited. Additional research is needed that will further explore how visitor and exhibit characteristics interact with attention, the first step in learning. Findings in these areas may suggest modifications museums may make that could increase their educational effectiveness and change visitation patterns.

Statement of the Problem

The problems explored in this study include (a) to what extent is attention in natural history museums focused on objects and exhibits as opposed to other visitors; (b) to what extent is attention in natural history museums affected by the exhibit hall topic, exhibit location within the museum, and exhibit type; (c) to what extent is attention in natural history museums affected by whether the occasion is a first-time visit or repeat visit to the institution; and (d) to what extent is attention in natural history museums affected by gender, race, socioeconomic status, general achievement, science achievement, and interest in science. Although attention has been examined extensively in museums, this research study adds to the literature because of its use of photography as a way to quantify and qualify attention and its focus on African American and White middle school students in an effort to examine their responses to objects and people (Damico, 1985).

Definition of Selected Terms

For the purposes of this study, the terms listed below are defined as follows:

The formal learning setting is the classroom, in contrast to informal learning settings such as museums, zoos, aquaria, libraries, camps, Scout meetings, hobby shops, and homes (Crane, 1994; Koran & Koran, 1988; Koran & Shafer, 1982).

Learning is "a relatively enduring change in behavior due to experience" (Chance, 1988, p. 23).

Attention, the first step in learning, is the focusing of mental processes on something. Attention is both selective and limited in capacity (Bransford, 1979).

A museum is a

> . . . non-profit permanent, established institution, not existing primarily for the purpose of conducting temporary exhibitions, exempt from federal and state income taxes, open to the public and administered in the public interest, for the purpose of conserving and preserving, studying, interpreting, assembling, and exhibiting to the public for its instruction and enjoyment objects and specimens of educational and cultural value, including artistic, scientific (whether animate or inanimate), historical and technological material. Museums thus defined shall include botanical gardens, zoological parks, aquaria, planetaria, historical societies, and historic houses and sites which meet the requirements set forth in the preceding sentence. (American Association of Museums definition, as cited in Ambrose & Paine, 1993, p. 8)

Objects are the artifacts and specimens that museums collect that are representative of our cultural, scientific, and natural heritages. These objects may be placed on display in exhibits (Hicks & Munley, 1984).

Exhibit taxonomy is a classification system that places exhibits on a continuum from static or case exhibits to walk-through or life-size environmental exhibits to dynamic or interactive exhibits (Koran, Longino, & Shafer, 1983).

Significance of the Study

The American Association of Museum's Task Force on Museum Education expanded on the initial work of the Commission of Museums for a New Century and the recognition of education by the Commission as a primary purpose of museums (Hicks & Munley, 1984; AAM, 1992). *Excellence and Equity* (AAM, 1992), the report of the Task Force, stressed the importance of education, that museums should become more inclusive, and that leadership roles both within and outside the museum community should be established. This report called for a "new definition of museums as institutions of public service and education, a term that includes exploration, study, observation, critical thinking, contemplation, and dialogue. . . . The public educational responsibility of museums has two facets: excellence and equity" (AAM, 1992, p. 6). A plan of action, that included ten principles, was presented for the critical issues related to excellence and equity. Among these principles were ones that reaffirmed the centrality of education for museums, the importance of the diversity of our society being reflected in the museum audience, and the importance of increasing our knowledge of and use of the learning experiences afforded by museums (AAM, 1992). This research study will contribute to our knowledge about attention in museums in general and focus specifically on similarities and differences in responses to exhibits and objects versus people by African American and White adolescent museum visitors. These findings may have implications for exhibit design as well as perhaps ultimately influencing who becomes a member of the museum audience since there are currently significantly fewer African American than White visitors (DiMaggio & Ostrower, 1992; Falk, 1993a; Hood, 1993a).

The number of museums nationwide provides one type of information about museum popularity, while attendance figures provide another type of information about the role of museums in our society for different segments of our population. Attendance at museums in the United States doubled from 200 million to 400 million during the decades following 1965, was more than 500 million a few years later, and continues to increase (Falk & Dierking, 1992; AAM, 1994). In spite of the overwhelming popularity of museums illustrated by these statistics, several questions must be asked. Does the museum audience reflect the diversity of our society? If it does not, what can museums do to become more inclusive institutions? Are there differences in ways visitors pay attention to objects and exhibits that may affect the educational effectiveness of the visit, who comes to museums, and who profits from the experience itself? Pertinent to these questions, AAM's Standing Professional Committee on Education (1990) described the tasks of the museum educator as being:

> to identify audiences and articulate clear educational objectives in order to develop appropriate communication and interpretive strategies. These strategies can then be employed to create links between visitors and objects so that curiosity is fostered and exploration of ideas, topics, or objects is encouraged. (p. 80)

Most of the visits to museums are made by about one in seven Americans while the occasional visitors and non-visitors are approximately equal in number for the remaining 85% of the public (Yellis, 1990). Falk (1993a) conducted two studies to determine why museums are underutilized by African Americans. When African American and White visitors at four science-related museums were compared, both groups were found to be better educated, have a higher income, and a strong interest in science, which is consistent with other demographic data. The second study examined leisure behavior and suggested that African Americans are half as likely to visit museums as are Whites with four factors being the most important determinants. Three negative factors were socioeconomic variables, perceptions that museums are racist institutions, and past and present museum-going habits. Church-going was a positive factor that seemed to increase attendance. Falk cautioned that it may take time to change the present leisure patterns of African Americans.

Hood (1993) also examined museum attendance and non-attendance by African Americans to see if those who attend shared the same characteristics as previous studies have attributed to art museum visitors (higher education, upper occupation, higher income, socialized into cultural activities, and active in cultural and community activities). She analyzed the comments made by focus group participants and those from individual interviews. Hood wrote that the misperceptions minority cultures have about museums must be addressed first and she reminded us that all visitors ask questions about the meaning of the museum to them personally and whether the museum cares about them.

Differing perceptions of institutions and ways of handling the content within them may affect not only who utilizes the institution, but also what occurs during participation. Pertinent to the present research is a study conducted by Damico (1985) in three middle schools that found differences in the people versus object orientation of photographs taken by African American and White adolescents. Photography was used as a research tool to examine student perceptions of school. Damico suggested that these differences in perceptions may interact with the formal school curriculum and thus affect achievement. Photography may be an important research tool for museums that will provide information about differences in African American and White attention to exhibits and objects and perhaps information about cognitive and affective changes that occur during the visit.

Museums are important educational institutions that can contribute to both formal and informal learning (AAM, 1992; Alexander, 1988; Donald, 1991; Druger, 1988; Ramey-Gassert, Walberg, & Walberg, 1994). Tressel (1988) described the contribution of museums to lifelong learning:

> Informal learning is important before school, during school, and as a major part of a pattern of lifelong learning. Informal education is a major component of the overall science education pattern -- not as a substitute for formal education, but as an important contribution to the preparation for classroom learning and an important influence on enthusiasm, curiosity, and eagerness to study. Equally important, early informal education helps to set a pattern of exploring, self-education, and recreational learning. (p. 23)

In addition, Gardner (1993) suggested that for children, museums afford opportunities to "develop a sense of how to pose questions, how to try things out, and how to test misconceptions and stereotypes" (p. 11).

Although museums are popular, their audiences are not reflective of society in general and therefore some members of our society are not equal recipients of the educational benefits of these institutions. The museum community has made a commitment to increasing audience diversity and to increasing our knowledge about how people learn in these settings. "Informal learning in science is a potentially valuable adjunct to school instruction. The very nature of the informal setting and the tremendous resources available here for instruction need to be mined" (Koran & Shafer, 1982, p. 62).

Since museums house objects, and objects require the knowledge of process skills including observation, inference, and classification (concept formation), this research study may indicate the importance of teaching these skills in both formal and informal settings. These process skills may decrease the differences in attention that have interacted with the "museum curriculum" and resulted in differences in the educational benefits obtained from the museum visit. Hence, this study is a first step, designed to determine whether African Americans responses in museums are similar to their responses in schools when confronted with a choice between attending to objects or other people (Damico, 1985). If so, ways to modify exhibit designs to mitigate these differences can be explored as well as programs developed for children and their parents in both formal and informal settings on how to process information from objects.

CHAPTER 2
LITERATURE REVIEW

The learning and memory model that focused on attention and perception, adapted by Koran, Longino, and Shafer (1983) from Gagne (1970, 1973), Keele (1973), and Bransford (1979), forms a theoretical foundation for this research study. Figure 2-1 illustrates the importance of attention, perception, and coding in transferring information from a stimulus to memory. These steps are significant if a learner is to learn from objects.

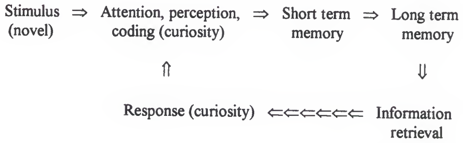


Figure 2-1. Learning and memory model (Koran, Longino, & Shafer, 1983, Fig. 3).

A framework developed by Koran and Koran (1986) has been used by researchers to better understand what takes place during museum visits and what is learned from exhibits. The framework was adopted from cognitive psychology and incorporates the learning and memory model shown above as its base. This framework, used in the present study and shown in Figure 2-2, places the visitor in the center of four different variables. The three independent variables are the characteristics of the visitor, visitor processing activities, and the exhibit types with the dependent variable as the desired outcome. All four variables must be considered concurrently when any question about learning in museums is explored. Literature from both formal and informal settings are reviewed in this chapter to provide an understanding of the independent and dependent variables this research study examines.

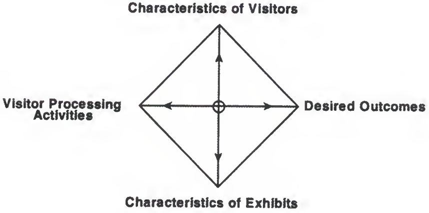

Characteristics of Visitors
Visitor Processing Activities
Desired Outcomes
Characteristics of Exhibits

Figure 2-2. Framework for museum education research (Koran & Koran, 1986, Fig. 1).

Variables influencing learning in museums include such things as prior knowledge, age, gender, verbal ability, time of day, and cognitive style (Koran & Koran, 1986). This research study is concerned with the following visitor characteristics: gender, race, socioeconomic status, general achievement, science achievement, and interest in science. The literature demonstrates how extensively these characteristics interact with each other and with the exhibit characteristics and the visitor processing activities. Exhibit characteristics that are considered include the role of objects for museum visitors, the topic of the exhibit hall, where the exhibit is located on the floor plan, and exhibit type--static, dynamic or hands-on, walk through, or any combination of the three types (Koran, Longino, & Shafer, 1983). The influence of the novelty of the museum setting, in terms of whether the museum visit is a first-time or repeat occasion, is investigated. And lastly, visitor processing activities, in particular attention, are variables of interest. This study examines photographs taken by a specific group of museum visitors (middle school students), rates them on their object vs. people orientation, and examines these results in relation to the visitor and exhibit characteristics.

Characteristics of Visitors

Who Goes to Museums and Why

It is important to examine who the unguided visitors are, why they come to museums, and what do they do, so that we may better understand how the attention of museum visitors is directed during their museum visit. A survey, funded by the National Endowment for the Arts, asked a series of questions about participation in the arts and concluded that any socialization in the arts during youth was associated with higher participation during adulthood (Orend, 1989). Thus studies that consider youth in museums, including school group participants, provide insights about adult participation as past participation and past leisure may be the best predictor of future leisure activities (Hood, 1981, 1983, 1989). In fact, Hood (1991) cautions us that a bad experience during a school field trip may result in non-attendance for many years.

Most museums conduct demographic surveys of their visitors that include such factors as age, gender, race, income, occupation, level of education, marital status, age of children, and group composition (Hood, 1993c). From these surveys, museums have characterized their visitors as having higher levels of education, occupation, and income;

being relatively young; and being active in other types of community and leisure activities (e.g. Falk & Dierking, 1992; Hood, 1989, 1993a; Kelly, 1992; Screven, 1986b). A recent study (Doering, 1995) designed to characterize who attends our cultural institutions conducted 2009 telephone interviews with a random sample of the national population and found that these institutions share a single audience among them. The study found that as education increases, attendance increases and that income has a positive impact on attendance but is not as important a factor as education. Attendance also was found to increase with age until retirement when there is a decline. When education was considered, race/ethnicity was not significant. Although this information is very important, many researchers feel it is critical to examine psychographic characteristics such as interests, attitudes, opinions, perceptions, values, goals, activities, group memberships, and social position as well as other factors because they help explain visitor motivations, expectations, and satisfaction in addition to participation and non-participation (Alt, 1980; Cheney, 1992; Hood, 1981, 1988a, 1992, 1993a; Hood, Short, & Adams, 1992; Kelly, 1992; O'Hare, 1974; Prince, 1990; Wolf, 1990).

In a series of studies, Hood (1981, 1983, 1988b, 1993a, 1993b) examined attributes important in making choices about leisure time and how the importance of these attributes varied for the frequent museum visitor, the occasional visitor, and the non-visitor. The six attributes include being with others, doing something worthwhile, being comfortable in one's surroundings, new experience, opportunity to learn, and active participation. Although Hood found that all of the attributes were important to the frequent visitor, the most critical ones were the opportunity to learn, the challenge of a new experience, and doing something worthwhile. In contrast to the frequent visitor, the occasional visitor and the non-visitor shared the attributes of active participation, social interaction, and feeling comfortable as being very important when making leisure-time choices. It was probable that the non-visitors were not socialized to museum going when they were young (Hood, 1983). A number of researchers who examined the social interactions that occur during the museum visit (e.g. Diamond, 1980; Dierking, 1987; Gottfried, 1979; McManus, 1987a, 1987b; Rosenfeld & Terkel, 1982) found that as the group composition varies, so do the interactions. Family visits are child-oriented, social occasions with children being the most active participants and conversation an integral component. However, group management is a critical part of the family visit. Teachers and students also view field trips to museums as social occasions, during which students can learn from each other through observation or peer teaching. Both single visitors and couples spend more time reading in exhibits than do families or adult social groups.

Thus, past leisure patterns are the best predictors of future leisure activities and the leisure attributes most valued by frequent museum visitors are different from those which are most valued by both the occasional visitor and non-visitor. The importance of each of these leisure attributes, as well as demographic and psychographic characteristics, must be considered when programs and exhibits are being developed for different audiences. This study examines how attention is affected by these leisure attributes as well as by demographic and psychographic characteristics.

Race, Socioeconomic Factors, and Gender

Race, in terms of African American and White similarities and differences, was examined here, first from the broader museum context of the general visitor and then from a school context. DiMaggio and Ostrower (1992) extensively analyzed data gathered from the 1982 and 1985 Surveys of Public Participation in the Arts (SPPA), which were conducted by the U.S. Bureau of the Census at the request of the National Endowment for the Arts as a part of the National Crime Survey. These surveys provided invaluable information because their scope and representation were national, the instrument was carefully constructed and administered, the questions were broad, and the sample was large. These surveys asked a series of questions about cultural participation including participation in core activities such as attending performances, visiting art museums or exhibits, reading imaginative literature, and performing in public as a musician, dancer, or actor; barriers to participation; socialization toward participation; non-arts activities; location of participation; musical preference; media use; and of particular interest to this study, other participation like visitation to historical or science museums and monuments. DiMaggio and Ostrower (1992) found that African Americans participated less in all of the core activities than did Whites with the exception of attendance at jazz concerts where their participation was the highest. The same differences between African Americans and Whites also were found for visitation to history and science museums, historical monuments, and arts or crafts fairs. However, when sociodemographic factors were considered, participation rates were found to be more similar with African American participation being only somewhat less. This study found that both education and income were more important than race in distinguishing between participants and non-participants. It is important to note that demand for participation appeared to be a factor of attendance in that those who attended more were more likely to want to attend more.

In order to learn more specifically about African American use of museums, Falk (1993a, 1993b) examined their leisure decisions in two studies. Four variables were identified as being potentially accountable for the under-utilization of museums by African Americans. What is learned about under-utilization of museums has important implications because as Falk (1993a) wrote, "By virtually any measure one wishes to use, African Americans, as a whole, do not appear to be receiving equal benefits from the educational opportunities available either in the formal or informal education sectors" (p. 4). He went on to say, ". . . out-of-school experiences may contribute as much, if not more, to future educational attainment as do in-school activities" (Falk, 1993a, p. 4-5).

In one study, Falk (1993a, 1993b) examined the background and motivations of 50 African American and 50 White family groups at science-oriented museums. The four study sites included the National Museum of Natural History, Washington, D.C.; the National Zoological Park, Washington, D.C.; the California Museum of Science and Industry, Los Angeles; and the Maryland Science Center, Baltimore. Falk (1993a) reported that

> The overwhelming impression left by the data is that despite a number of differences in the background, interests, and behaviors of African American and white science-related museum visitors, these two populations are very similar. On virtually every measure -- interest in science, education, occupation, annual income, going to museums as children, what factors influenced their decision to visit the museum, the frequency of museum going, and their leisure time preference ratings -- the general pattern of response was consistent between blacks and whites. In general, both black

> and white visitors to these four institutions, and by extension other similar institutions, can be described as generally affluent, well educated, and with a strong interest in science. (p. 29)

The differences that Falk found included that women composed two-thirds of the adult African American visitors compared to slightly more than half of the White, the proportion of African American children was higher than the White proportion, and African American families tended to visit in groups. He also found that the White visitors were more likely to have science-related careers, advanced degrees, and higher incomes and that church-going was much higher for the African American visitors. When asked to rank Hood's six leisure-decision-making criteria discussed previously, the four most important criteria for both African American and White visitors were feeling comfortable, challenge of new experiences, opportunity to learn, and doing something worthwhile.

In another study aimed at obtaining information about leisure-time activities in general and museum use specifically, Falk (1993a, 1993b, 1995) conducted in-depth, home interviews with 333 African Americans and found that they were half as likely to visit museums as were Whites. These interviews revealed that the most important of Hood's leisure criteria for all three categories of African American museum visitors, the non-, occasional, and frequent, were feeling comfortable and at ease in surroundings; thus these criteria did not distinguish well among the three visitor categories. Again, from the results of this study, it was evident that the characteristics of African American and White museum-goers were very similar. While education and income were important variables, the community where you live, being over the age of 40, and regular participation in church-related activities also were found to be positively correlated with museum-going behavior of African Americans, although they did not reliably predict this behavior. Subjective evidence of negative perceptions of museums as racist institutions appeared to negatively affect visitation.

From these studies, Falk (1993a) concluded that "African Americans, like Americans of all races, infrequently go to museums" (p. 73). But, he found that for frequent visitors, which comprised about 20% of the population, the percentage for African Americans was probably nearer 10%. However, the overall leisure patterns of African Americans and Whites were virtually the same. Of the four variables he investigated in this study, three had a negative influence on museum-going and one had a positive influence. Falk (1993a) reported that "the negative factors are socioeconomic variables, racism (real and perceived), and the museum-going habit (past and present). The positive factor is church-going" (p. 82). Falk felt that the most important factor affecting present museum use was the lack of this tradition as a leisure activity and that this kind of change in leisure patterns as well as modifying the other two negative factors will take time.

In an investigation of class, regionality, and leisure among urban African Americans, Woodard (1988) conducted telephone interviews in a southwest Chicago community and found that, although the number of full-time employed adults in the household was the best predictor of participation, social class and regionality also are important factors. He points out the importance of informal domestic activities to African Americans. In a study of racial differences in the perceived attractiveness of tourist destinations, Philipp (1993) showed participants colored photographs of a variety of places and asked them to rank the photos from most attractive to least attractive. The rankings by the African Americans and the Whites were very similar. In view of this, Hutchison (1988) cautions that studies of African American and White differences in leisure activities have not produced results that can be viewed as either conclusive or cumulative due to problems with the original constructs.

Hood (1993a) examined the museum-going patterns of African Americans who had characteristics (higher education, upper occupation, higher income, socialized into cultural activities, and active in cultural and community activities) similar to those attributed to art museum visitors. Hood divided the respondents' comments about the dimensions and perceptions of art museums into two categories: the internal and external dimensions. The internal dimensions included that art museum exhibits were not usually inclusive of or relevant to minority cultures, exhibits on minority artists were usually scheduled only during February, minority cultures were generally not involved in the decision making process, and African American attendance would not change until there is a long-term commitment to inclusion. The external dimensions included that the African Americans' negative impressions of art museums were formed by past experiences, recent occurrences, and perceptions of the museum as an elitist entity; offerings were not promoted to African Americans so they continue to be outsiders; minority participation was viewed as a necessity for funding rather than a true commitment to serve these audiences; and minority cultures must feel respected, welcomed, and comfortable. Hood's findings certainly paralleled those of Falk (1993a, 1993b) and again illustrated the strongly negative impact of the institutional factors of real or perceived racism and lack of personal connection.

Bitgood (1993a) investigated racial differences in the impact of a museum visit to the Anniston Museum of Natural History made by 85 White and 22 African American university students enrolled in an introductory psychology class. Following their visit, students completed an in-class survey containing demographic questions as well as experiential factor ratings of learning, interest, involvement, "comes to life," and enjoyment for each of the exhibit areas. The most consistent differences between the two groups of students were for the African Culture exhibit which the African American students rated higher than the White students on all factors. These results illustrated the importance of meaning that both Falk (1993a, 1993b) and Hood (1993a) identified for African American museum-going and as Bitgood (1993a) stated, "if a museum wishes to attract multicultural audiences, exhibits should be designed that will appeal to each of these cultural audiences" (p. 16). Bitgood and Thompson (1993) suggested a four-part strategy for increasing the multicultural pluralism of museum audiences that included: "1. change negative perceptions of the museum . . . 2. provide culturally relevant programs and exhibits . . . 3. involve multicultural audiences in decision making . . . 4. provide an environment that is psychologically and physically comfortable to the target audience . . ." (pp. 3-4). Dierking and Falk (1994) also suggested that museum-going must become part of the African American family leisure experience and that perceptions of institutions must change.

The underrepresentation of minorities in our nation's museums is important because the lack of both opportunities and different kinds of opportunities to learn science in the formal and informal education settings has been linked to the lower participation of not only African Americans but also females in science and math (Atwater, 1994; Baker, 1993; Catsambis, 1995; Erickson & Farkas, 1991; Kahle, Matyas, & Cho, 1985; Kahle & Meece, 1994; Oakes, 1990). Oakes (1990) extensively reviewed the literature concerned with the science and mathematics attainments of women and minority students. The three factors that were critical to attainment in science and math, and highly interrelated, were opportunities to learn, achievement in science or math, and deciding to pursue these subjects. Of all the variables that contribute to the differences in achievement levels in science, the most significant for racial/ethnic groups is opportunity to learn and for females is attitude toward science that results in lower confidence in abilities and less interest in science careers (National Science Foundation, 1994). However, Shade (1978) suggests that the most important factor in determining the achievement of African Americans is whether their is an academically supportive environment between the parent and child. Shade (1982) later points out that African Americans are people oriented while the school context is object oriented. It is important to note that although African American students show lower achievement, they are both enthusiastic about science and math and show very positive attitudes toward these subjects. Efforts to increase their opportunities to learn science from objects would appear to be a worthy goal.

Studies that report gender differences in science and mathematics are conflicting. Linn and Hyde (1989) conducted an analysis of previous studies and concluded that gender differences in cognitive and psychosocial tasks are both small and declining and that differences found are context specific. Other studies reported that the gender gap in science achievement increased from age 9 and favored boys at all grade levels in biology, chemistry, and physics (Becker, 1989; Kahle & Meece, 1994). Sources of these gender differences included stereotyped views of science as being masculine, differences in participation patterns both in and out of school, differences in teacher expectations, the nature of the tests themselves, and family influences (Kahle & Meece, 1994). Girls, however, were less positive about science; hence, future efforts should attempt to improve their attitudes and increase their interest. Positive role models were very important for both girls and minorities (Hill, Pettus, & Hedin, 1990; Atwater, 1994). Museums can provide these role models in exhibits, classes, and programs (Baker, 1993). Museums can develop exhibits and programs that are equally attractive to boys and girls as well as targeting girls in an attempt to increase their science interest (Kremer & Mullins, 1992). Rice and Linn (1978) found that free choice environments both encourage girls and help them do well in science because these environments provided girls with the freedom to choose activities and ways of working on the activities.

A variety of affective factors have been investigated to determine their impact on the lower participation in science by women and minorities (Oakes, 1990). Differences included that girls and minorities showed a greater interest in "people" while White boys showed a greater interest in "objects." Other factors included one's liking for math and science, the perceived usefulness of these subjects, stereotyping of gender roles for these subjects, and confidence in abilities. For museums and other informal settings, increasing access to exhibits, classes, and programs can possibly have a positive impact on participation in and attitudes toward science and math. Moreover, because women and minorities have shown a greater interest in people than things in formal contexts, and because of the often abstract nature of science and math (Oakes, 1990), museums may perform an invaluable role because of their ability to present ideas in a context that can be made socially relevant.

Weinburgh (1995) conducted a meta-analysis of the literature related to gender differences in student attitudes toward science and reported that boys have a more positive attitude toward all kinds of science than girls and that a positive attitude resulted in higher achievement. Diamond, Cleary, and St. John (1986) examined the long-term impact of participation in the Exploratorium's Explainer Program (San Francisco) on science learning, interests, and the pursuit of science careers through in-depth interviews with 32 past participants and survey completion by 116 past participants. The Explainer Program uses teenagers to help visitors on the exhibit floor as well as to provide staff support in the areas of maintenance and security. Explainers are not selected for their science background but instead for their curiosity, friendliness, enthusiasm, and diversity. The impacts of program participation included the following: 80% felt their participation strongly enhanced their curiosity about how things worked, 67% felt their interest in science was strongly influenced, 66% felt that they gained confidence in their abilities to understand science, and 63% felt that their participation increased their desire to learn on their own.

Many museum studies have looked at gender differences in family visitors. For example, Cone and Kendall (1978) examined gender and generation-role patterns as well as attention at the Science Museum of Minnesota (St. Paul). They found that mothers were the main teachers within the exhibits and that they divided their attention almost equally between sons and daughters. Fathers, however, directed most of their attention at sons but engaged in much less verbal interactions than mothers. Daughters were the least likely to participate verbally and they infrequently addressed fathers while sons addressed both parents equally. Rosenfeld and Terkel (1982) studied family behavior in zoos and found that expectations and behavior were primarily child-oriented. The children were activity oriented and controlled the pattern and pace of the visit while parents were more concerned with group management.

Diamond (1980, 1986) investigated family behavior at the Lawrence Hall of Science (Berkeley) and the Exploratorium. Among her findings were that fathers, sons, and daughters approached exhibits first significantly more than mothers, who were more likely to follow others; mothers were more involved in management of the visit; mothers and daughters included each other in exhibit manipulations more frequently; teaching was a reciprocal activity between parents and children; and sons were involved in both showing and manipulating exhibits while daughters just manipulated. Diamond (1994) noted that girls engaged in more cooperative behavior at museums exhibits and boys explored more actively. She advised that gender differences are not clear cut because of conflicting results from studies conducted at different institutions and even within the same institution.

Dierking (1987) studied families and attention-directing behaviors at the Florida Museum of Natural History (Gainesville). Gender differences were not found in the attentional behaviors of fathers or mothers when paired with either sons or daughters. And, Stevenson (1991) found few gender differences in the ways visitors interacted with exhibits at the Launch Pad, Science Museum (London). However, at this same museum, Blud (1990a) found that boys performed significantly better overall at exhibits than girls with the difference being greatest at push button exhibits and that children performed better with mothers than with fathers. In fact, girls with their fathers performed the worst. Adult males also performed better than adult females, and adult and child females showed less understanding of the exhibit concepts than did males. Blud (1990a) and Cone and Kendall (1978) questioned whether science exhibits were perpetuating the gender biases and behaviors of society. In contrast to Cone and Kendall's (1978) results, Blud (1990b) found that fathers started more interactions than mothers, girls received more attention than boys, and boys were the least likely to begin interactions.

Greenfield (1995) also questioned whether science exhibits were being used in similar ways by males and females in a study conducted at the Bishop Museum (Honolulu). She observed the behavior of museum visitors on weekends and weekdays so that data for adults, adults with children, and children on field trips was collected on the relative attraction of different hands-on science exhibits designed to teach life, physical, and problem-solving science concepts. No significant sex differences in exhibit choice were found for the adults. However, although both boys and girls used all types of exhibits, the greatest differences were found for unaccompanied children with girls more likely to use puzzle and life science exhibits and boys more likely to use computers and physical science exhibits.

McManus (1987a, 1987b) found that the females in an adult social group were more likely to use interactive exhibits. Koran, Longino, and Shafer (1983) observed males looking at objects and moving more quickly through exhibits than females. Bitgood and Bishop (1991) used a bipolar adjective survey to examine affective responses related to current visit, prior visit, and gender. Females and repeat visitors rated the experience more positively than did males and first-time visitors.

In conclusion, differences due to race, socioeconomic factors, and gender are complex, interrelated, and in some instances, inconclusive. However, it does appear that African American and White museum visitors are more well educated and earn higher incomes (DiMaggio & Ostrower, 1992; Falk, 1993a, 1993b); real or perceived racism and lack of a personal connection negatively influence participation by African Americans (Bitgood, 1993a; Bitgood & Thompson, 1993; Dierking & Falk, 1994; Falk, 1993a, 1993b; Hood, 1993a); differences in opportunities in both formal and informal settings have been linked to decreased participation rates in science and math for both females and African Americans (Atwater, 1994; Baker, 1993; Catsambis, 1995; Erickson & Farkas, 1991; Kahle, Matyas, & Cho, 1985; Kahle & Meece, 1994; Oakes, 1990); girls and minorities demonstrate a greater interest in people in contrast to the interest in objects shown by White boys (Oakes, 1990; Shade, 1982); and informal settings can positively affect students (Baker, 1993; Diamond, Cleary, & St. John, 1986; Rice & Linn, 1978).

This research study extends these findings and examines attention and how it is influenced by race, gender, and SES.

Interest in Science

Our attitudes show our likes and dislikes toward some entity; they are learned from active or vicarious experiences, are generally consistent, and are related to behaviors (D'Agostino, Loomis, & Webb, 1992; Koballa, 1988). Attitudes may be measured by Likert scales, interest inventories, or semantic differentials as well as by interviews and observations (D'Agostino, Loomis, & Webb, 1992 ; Simpson, Koballa, Oliver, & Crawley, 1994). Because attitudes can be measured by interest inventories, if interests are positive, one would expect attitudes to be positive. It is important to examine interests and attitudes because affective and cognitive variables interact in learning (Koballa, 1988; Martin & Briggs, 1986).

Interest in attitude increased dramatically after the publication of Bloom's book in 1976 that suggested that 25% of the variance in school achievement could be explained by students' attitudes toward the subject, school, and themselves. To learn more about the role of attitudes, NSF funded a large, comprehensive, multidimensional, longitudinal study in 1979 that examined home, school, and individual variables and their influence on attitude toward and achievement in science among adolescent students (Simpson & Oliver, 1990). Findings that are significant to this research included that attitude toward science decreased each year from grades 6 through 10, was consistently higher for boys, and was lower for African Americans in sixth, seventh, and eighth grades. It is important to note that these racial differences stayed the same when gender also was considered. The "dramatic underrepresentation of women and non-Asian minorities in the science and engineering pipeline is attributable as much to a lack of interest in pursuing either of these academic routes as it is to inferior science and mathematics achievement" (Simpson et al., 1994, p. 230).

Research evidence about gender effects is conflicting though, with some studies showing more positive attitudes for boys and others showing no difference (Barrington & Hendricks, 1988; Koballa, 1988; Simpson, Koballa, Oliver, & Crawley, 1994; Steinkamp & Maehr, 1983). Atwater and Wiggins (1995) found that only 25% of the middle school students in a southeastern urban school system with 91% African American students had very positive attitudes toward science. No relationship between attitude and socioeconomic status (SES) has been shown (Simpson, Koballa, Oliver, & Crawley, 1994).

Interest in science is an important variable for the present study because many researchers have felt that the primary value of museums is in the affective domain rather than the cognitive (Ames, 1993; Kelly, 1992; Miles, 1987; Roberts, 1993; Tulley & Lucas, 1991). Roberts (1991) described this importance as "the role of affect in learning should be of particular interest to museum professionals since the nature of our medium is profoundly affective. It is the nature of our institutions--multisensory, three-dimensional, interactive--that they should appeal so strongly to that part of the brain concerned with space, image, affect" (p. 133). Also, one of the best predictors of participation in informal activities is prior interest (Crane, 1988).

Participation in extracurricular science activities has been shown to result in more positive attitudes toward science including greater interest, increased enjoyment, and finding science easier (Druger, 1988; Hofstein, Maoz, & Rishpon, 1990). For example, 67% of the students in the Exploratorium's Explainer Program felt their interest in science increased as a result of their participation in the program (Diamond et al., 1986). Also, attitudes toward a conception of science-technology-society (STS) have been found to be significantly more positive for students who visited a science-technology museum than for those who did not (Finson, 1985; Finson & Enochs, 1987). In this same study, students who participated in pre-visit, in-museum, or post-visit activities, or some combination of the activities scored significantly higher on the Scientific Attitude Inventory than students who did not. No significant differences in attitudes were found for classroom lessons in STS prior to the museum visit versus no lessons, and attitudes were not affected by SES or gender. Finson and Enochs questioned whether the differences in attitudes can be attributed to the museum visit or whether there were some other confounding factors. Davis (1990) also suggested that affective, and not just cognitive, learning should be included in research studies that are examining the effects of field trips to informal settings. Davis (1990) found that students were interested in objects that were of personal interest and that "students were looking beyond the factual to aesthetic aspects of the learning environment" (p. 100).

The relationships among interest in science, gender, and race are complex and inconclusive. The present study explores these relationships and how they affect attention. These variables are of importance to museums because of the affective nature of the museum visit and because "culture and society may be playing a more subtle role in differentially shaping aptitude and achievement through early, and largely extra-school experiences" (Steinkamp & Maehr, 1983, p. 389).

Participation in Field Trips to Informal Settings

Bruno Bettelheim (1984) described the value of museums for children in the following way:

> This, then, I believe to be the museum's greatest value to the child, irrespective of what a museum's content may be: to stimulate his imagination, to arouse his curiosity so that he wishes to penetrate ever more deeply the meaning of what he is exposed to in the museum, to give him a chance to admire in his own good time things which are beyond his ken, and, most important of all, to give him a feeling of awe for the wonders of the world. Because a world that is not full of wonders is one hardly worth the effort of growing up in. (p. 19)

Large numbers of school field trips are made each year to museums throughout the nation. In 1988 alone, 49 million children visited museums in school groups (AAM, 1994). However, even though millions of school children visit informal settings each year, the discussion about the actual benefits of these trips continues with conflicting results from numerous research studies. There is general agreement that these settings provide opportunities to develop thinking skills as well as opportunities different from those in the classroom because of the uniqueness of the objects and exhibits and their ability to add a three-dimensional reality to the curriculum (Koran & Baker, 1978; Javlekar, 1989; Prather, 1989; Robinson, 1991). Researchers have cautioned teachers that in order for field trips to be effective, teachers must be familiar with the setting, develop objectives for the trip that take advantage of the unique setting, determine the students' prior knowledge and interests, prepare and focus the students' attention with prior instruction, logically structure and sequence the instruction, motivate students, provide a variety of activities and methods of instruction to cover the content, and evaluate the experience and provide feedback to the students (Bitgood, 1989; Bitgood, 1993b; Koran & Baker, 1978; Koran, Koran, & Ellis, 1989; Linn, 1980; Price & Hein, 1991).

A variety of research studies have been conducted in museums and other informal settings to learn more about the benefits and effects of school field trips. For example, Eason and Linn (1976) examined the effectiveness of participatory exhibits for teaching scientific principles at the Lawrence Hall of Science and found that students who visited the optical exhibits were able to recall information and solve problems using acquired manipulative skills better than the controls who did not utilize the exhibit. Linn, Chen, and Thier (1977) found that the most popular activities in a free-choice environment did not necessarily involve variables that the children were familiar with but instead involved making a product like bubbles or crystals or producing an interesting result. They found that although the children did not make tremendous cognitive gains, this environment was a good motivational tool.

Gottfried (1979, 1980) used a variety of data-gathering procedures to learn about children's behavior in the Biolab of the Lawrence Hall of Science. Among his findings were that the field trip was an important social occasion for both the students and the teachers, the children became most involved in the exhibits when they worked as dyads, the children learned from each other by both peer teaching and observation, the children's discoveries and learning were highly individual and varied greatly according to prior experience, children used the knowledge they gained during the field trip in later peer teaching sessions, and children spent more time at manipulative exhibits than at static exhibits. Of particular note for this study, Gottfried also was interested in the student's visual learning, which he assessed by having them draw a map of the setting two weeks after the field trip. He found that 50% of the exhibits were correctly labeled and suggested that these cognitive maps helped the children recall facts and information.

Carlisle (1985) also examined children's behavior at a science center and described the visit as both a social and solitary experience with the initial exhibit interaction often being solitary. No significant differences were found between boys and girls in their levels of interaction with the exhibits, number of exhibits seen, or length of viewing. Birney (1988) found that children came to the Los Angeles County Museum of Natural History and Zoo ready for learning experiences that they valued in settings perceived as social institutions. The children did not seem to separate learning from enjoyment.

Feher (1990) described exhibit learning as

> . . . an experiential, exploratory and explanatory process. The users first undergo an experience in which they can actively participate; they then give meaning to the experience through their own interpretations and explanations. These explanations are validated or confronted repeatedly as the learners use multiple related exhibits. (pp. 47-48)

Tuckey (1992a, 1992b) and Feher and Meyer (1992) found that at science centers, children combined the experiential knowledge they learned at interactive exhibits with their everyday knowledge to create new understanding. These settings provided opportunities for social interactions that are important for learning and fostered positive attitudes toward science.

Wright (1980) found that 6th grade students who participated in a multisensory, hands-on review lesson at a museum did significantly better on a posttest of knowledge and concepts about the human body than did students who participated in a classroom review. Adams, Thomas, Lin, and Weiser (1989) found that students who viewed a static exhibit on wildlife made significant knowledge gains. Gennaro (1981) determined that the use of previsit instructional materials to focus students' attention is valuable for students of all ability levels. In a similar study, Stankiewicz (1983) discovered that the recall and application scores for students who had an advanced organizer were significantly higher than the control group. Flexer and Borun (1984) found that although students liked the exhibit experience significantly more than the lesson, they learned more in the lesson. Stronck (1983) had similar findings with structured and unstructured tours in that students learned more on the structured tours but had more positive attitudes on the unstructured tour. Stronck suggested that field trips are very important for improving students' motivation. De Andrade (1989) also observed that structured tours resulted in significantly higher achievement test scores and that there were no gender differences in achievement. Bennett (1965) found no difference in either cognitive gains or attitude changes between an experimental field method and a traditional classroom method for teaching ecology. Reams, McCallum, and White (1991) determined that the addition of artifact demonstrations to tours did not significantly impact measures of learning, attitude, or interest. All of these findings contribute to our understanding of the benefits and effects of school field trips. Although museum field trips have been recognized as social occasions, whether students direct their attention toward other students or the objects and exhibits on display has not been explored.

Falk and colleagues investigated the role of novelty on children's behavior and learning in a series of studies (Balling & Falk, 1982; Falk, 1983b; Falk & Balling, 1982; Falk, Martin, & Balling, 1978; Martin, Falk, & Balling, 1981). They discovered that learning is greatest in a setting where novelty is neither too high nor too low and that the percent off-task behavior is lowest in a setting where novelty is neither too high nor too low. Kubota (1985) and Kubota and Olstad (1991) found that novelty-reducing preparation resulted in increased on-task behavior and learning in boys but was not effective for girls. Judd (1988) observed that the groups who learned the most were those who experienced the program in the museum after becoming familiar with both the setting and the objects. Falk (1983a) also found that the behavior patterns of children in India are similar to those of children in the United States. He suggested the importance of preparing children for new settings either through the use of pre-visit materials or on-site orientations to increase the amount of learning that occurs during a field trip.

Falk and Dierking (1994) and Falk (1996) have examined the long-term impacts of school field trips by looking at student memories of these trips. They interviewed fourth graders, eighth graders, and adults and found that 96% could recall a field trip and 80.5% could remember three or more specific events or things from the trip. Their recollections illustrated the value of field trips, showed that they were positive social experiences, and provided evidence of cognitive learning.

A variety of research studies have shown that school field trips to museums and other informal settings resulted in cognitive and/or affective changes and that these changes are long lasting. The present study adds to the literature by examining student attention and its focus on objects or people.

Characteristics of Exhibits

Formal and Informal Settings

Before examining exhibits specifically, it is first helpful to compare formal settings with informal settings (Bitgood, 1988; Bitgood, Serrell, & Thompson, 1994; Crane, 1994; Falk, Koran, & Dierking, 1986; Koran & Shafer, 1982; Laetsch, Diamond, Gottfried, & Rosenfeld, 1980; Linn, 1983; McManus, 1992; Munley, 1987; Screven, 1969, 1986b, 1988; Templeton, 1988). Classrooms are formal settings while museums, zoos, science centers, clubs, and homes are examples of informal settings. In formal settings, the learners are of similar ages and backgrounds, motivation is extrinsic, and attendance is mandatory while in informal settings the learners are of all ages and have diverse backgrounds, motivation is intrinsic, and attendance is voluntary. In formal settings, the learning conditions and content are prescribed, organized and sequenced, and experienced by all students in a standardized manner in contrast to the informal setting where learning is free choice, the content is variable, and the individual decides how much time will be spent and on what objects and exhibits. "Museums offer a unique encounter with objects and ideas for people of many ages, interests, capabilities, and backgrounds" (AAM Standing Professional Committee on Education, 1990, p. 78).

The Role of Objects

Objects are the foundation of museums and central to exhibits. However, Weil (1990) cautioned us that ideas are at the heart of the museum and that objects have meaning only through our conceptual frameworks and assumptions. Pitman-Gelles (1985) described the role of objects as follows: "the 'power' that a museum has is contained in the learning that it fosters through the objects it displays. The impact of these objects on a child or adult--whether in a school group, family outing, or on a visit with a friend--is real and immediate" (p. 114). She goes on to say that "this personal response to objects is an important and inherent part of teaching and learning in museums" (p. 118) and that "learning in a museum often begins as a visual experience; it then branches out into a range of learning experiences that can include comparing and contrasting, problem solving, and the like" (p. 136). Munley (1987) reminds us that there is a difference in the amount of time necessary to read and learn versus the amount of time necessary to see and learn. Although researchers (Barnard, 1981; Barnard & Loomis, 1994; Bitgood, 1994b; Bitgood & Cleghorn, 1994) have examined visual learning in museums, our knowledge in this area is still limited.

Hooper-Greenhill (1991) described the attention given to objects as being qualitatively different from that given to the written word. She said,

> Working with real things enables all kinds of thinking to occur, including making comparisons, remembering, making relationships, classifying, interrogating, moving from concrete observations to abstract concepts, extending from the known into the unknown, and from specific observations to generalizations. (1991, pp. 102-103)

Objects allow the learner to go from the concrete to the abstract (Wolf & Tymitz, 1978) and the evidence for this is in what McManus (1990) described as the two most common questions in museums, what is this and what is going on. Resnicow (1994) wrote, "the bottom line is that people respond to real objects. Real objects make ideas and ideals real, bring an immediacy and reality to history, and serve as touchstones that inspire awe or make everyday objects seem extraordinary" (p. 151). Gartenhaus (1991) suggested that museums are good places for creativity and divergent thinking because of the number of ways objects can be interpreted. Cameron (1968) described the museum as a communication system, dependent on "the nonverbal language of objects and observable phenomena" (p. 34). Beer (1987a) called this the museum curriculum and described it as engaging visitors in nonverbal learning by encouraging them to interpret objects. Objects can be selected to illustrate both positive and negative examples of concrete concepts to help visitors distinguish between the important and unimportant characteristics (Belland & Searles, 1986). Falk, Koran, and Dierking (1986) describe science museums as being "extremely important institutions for conveying certain kinds of cognitive and affective science information to the public. In fact, for some very tangible kinds of information, i.e., those concretely exhibitable, they may well be the 'best yet devised'" (p. 507).

DeMouthe (1989) determined that static exhibits containing natural objects were the most educationally effective whereas those without objects were the least effective. Peart (1984) also found that concrete exhibits containing objects were more effective than abstract exhibits. Taylor (1986) observed that visitors to an aquarium were most interested in the concrete, visually verifiable aspects of exhibits rather than abstract concepts. At another aquarium, Hensel (1987) analyzed family conversations and found that they focused on the objects on exhibit and were primarily educational in nature. Other researchers (Falk & Dierking, 1992; McManus, 1989) have determined that conversations begin with the object and exhibit topic but they may go in directions distant from the original object (Falk & Dierking, 1992). Zeidler (1991) discovered that although visitors could determine the importance of items within an exhibit, they had more difficulty determining the exhibit message.

Graburn (1977) described the museum as fulfilling three needs of museum visitors, the need for the reverential, associational, and educational experiences. Objects are central to both the reverential and educational experiences. Hood (1991) cautioned that less experienced visitors need more help understanding objects. Prior knowledge, interests, cognitive ability, and other characteristics influence how visitors interpret museum objects and exhibits and what they learn and remember (Alt & Griggs, 1984; Bitgood, Serrell, & Thompson, 1994; Duckworth, 1990; Esteve-Coll, 1993; Falk & Dierking, 1991, 1992, 1995; Greenglass, 1986; Koran & Koran; 1986; Korn, 1991; McManus, 1993; Shettel, 1973). Pankowski (1991) described this as "the way in which people extract meaning from objects, and reapply those meanings to new and unfamiliar objects, lies, I suspect at the heart of museum-based learning" (p. 220).

In conclusion, objects form the base of museum learning and represent both concrete and abstract concepts. In order to learn from objects though, visitors must possess both the necessary concept learning strategies and process skills. However, the first step in the learning process is attention and the present study explores whether attention is focused on museum objects or other visitors.

Exhibit Location

The museum visitor experience is affected by the location of exhibits within a building as well as by the graphics and objects within an exhibit. For example, Melton (1935) found that visitors have a tendency to turn to the right upon entering a gallery, exits have a tendency to pull visitors so that their attention to exhibit elements may be decreased, and less attention is paid to exhibits as the museum visit progresses and the visitor becomes fatigued. Taylor (1986) also documented the right turn bias and "museum fatigue." Other studies have shown that first floor exhibits or exhibits near entrances were preferred (Koran & Shafer, 1982; O'Hare, 1974), visitors wanted to see the entire facility but were unwilling to backtrack (Taylor, 1986), visitors skipped 43% of the exhibits entirely (Beer, 1987b), two-thirds of the exhibits were viewed for less than 30 seconds or not at all (Beer, 1985), and architectural location and therefore accessibility affected exhibit attraction and effectiveness (Lakota, 1975b; Lakota & Kantner, 1976). Falk, Koran, Dierking, and Dreblow (1985) and Falk (1991) divided the museum visit into a set of behaviors that included periods of orientation, intensive looking, quickly looking, and leave taking. In this regard, Miles (1993) reports that visitors pay the most attention to exhibits during the first part of their visit. These findings are important to this research study because they indicate that the amount of attention paid to exhibits decreases as the visit progresses so that one would expect more of the exhibit photographs to be of exhibits seen earlier during the visit and located nearer to the museum entrance.

Exhibit Taxonomy

Koran, Longino, and Shafer (1983) developed a taxonomy that placed exhibits on a continuum from static to walk through to dynamic. Static exhibits were defined as case exhibits that contained objects and information. Most often, objects are studied and labels are read in these exhibits. The visitor is viewed as being passive, using vision as a sensory mode and sometimes hearing. Walk-through exhibits surrounded the visitor within a recreated setting that transports the visitor to another time and/or place, thus providing new stimuli. The visitor can utilize vision and hearing and sometimes touch and smell. Dynamic exhibits have been used widely in science museums and to a lesser extent in other types of museums. They have provided "hands-on" opportunities for active participation by the visitor and possible use of all of the senses. Eratuuli and Sneider (1990) found visitor participation resulted in both enjoyment and learning, teamwork was important, and exhibits were used creatively by many visitors. However, exhibits can be successful even though they don't provide physical participation (Bitgood, 1994a).

Many exhibits do not fall neatly into one of the three categories but instead have elements of all three types on the continuum. "Common to each exhibit is the free choice environment in which the visitor chooses to attend to the exhibit or not to attend, decides how to pay attention, in what sequence to attend, and for how long to attend" (Koran et al., 1983, p. 330).

In the present study, the pictures that the students take will be categorized as object or people oriented as well as being related to the exhibit topic, the location within the building, and the exhibit type. Attention will be inferred from these results and related to the visitor characteristics.

Visitor Processing Activities

Attention

Because of the primary role of attention in learning, numerous researchers have examined visitor attention to exhibits and ways of increasing it. In a landmark study by Shettel, Butcher, Cotton, Northrup, and Slough (1968), they described exhibit effectiveness as being dependent on the initial attracting power, subsequent holding power, and teaching effectiveness of the exhibit. Early studies by Screven (1974a, 1974b, 1975) and DeWaard, Jagmin, Maisto, and McNamara (1974) examined the use of adjunct devices such as audio cassettes, visitor response devices, and programmed cards to direct and increase visitor attention. Since these studies, changing technology has added computers and interactive videos to exhibits and resulted in studies of their use and effectiveness (Diamond, Bond, Hirumi, 1989; Diamond, Bond, Schenker, Meier, Twersky, 1995; Guisti, 1994; Morrissey, 1989, 1991; Morrissey & Berge, 1992; Worts, 1989, 1991).

Researchers have examined other aspects of attention and ways of influencing it. For example, one study recessed objects in an exhibit (Dierking, Koran, Lehman, Koran, & Munyer, 1984) as a way of focusing attention and therefore increasing learning but found that this technique was not successful for the inductive learning task involved. Other studies looked at attention and curiosity behavior and found that attention increased when visitors were able to manipulate exhibits (Dierking, 1987; Koran & Koran, 1984; Koran, Koran, & Longino, 1986; Koran & Longino, 1983; Koran, Morrison, Lehman, Koran, & Gandara, 1984). Other researchers also have reported that interactive exhibits increase attention (e.g. Birney, 1993; Boisvert & Slez, 1994, 1995; Dierking & Falk, 1994; Their & Linn, 1976). Modeling was shown as an effective method of focusing visitor attention (Koran, Koran, Foster, & Dierking, 1988) and in a similar manner, exhibit interpreters were shown to positively focus visitor attention (Bennett, 1988). In a study that looked at the roles of interest and attention, Koran, Foster, and Koran (1989) found that the length of attention was more important than interest in determining learning. In a subsequent study, Foster (1993) found that as tasks demands increased, less effort was invested. Providing conceptual frameworks and linkages to existing knowledge and past experiences also have been shown to focus attention and increase learning (Ellis, 1993; Ham, 1983; Jenson, 1982; Koran, Koran, & Foster, 1989; Koran, Lehman, Shafer, & Koran, 1983; Miles & Tout, 1993; Screven, 1986b).

The studies discussed in this section and those in earlier sections of this literature review illustrate the role of attention in learning. The present study adds to what is currently known through the use of photography to produce a product that represents the focus of the visitor's attention, in contrast to the observation of behaviors and cognitive and affective measures utilized in earlier studies. If there are differences in the ways adolescents direct their attention in a natural history museum, then we can find ways to influence their attention so that they benefit more from the museum visit (Koran & Koran, 1984; Koran et al., 1988).

The Use of Photography

Photography has been used as a research tool in qualitative studies because of the invaluable descriptive data it provides (Bogdan & Biklen, 1982). Photographs have been divided into two categories: those taken by the researcher, and those taken by the subjects from which insights about the subjects' particular points of view may be inferred (Bogdan & Biklen, 1982). "While photos may not be able to prove anything conclusively, when used in conjunction with other data, they can add to a growing pile of evidence" (Bogdan & Biklen, 1982, p. 103).

Studies in informal settings have utilized photographs from both categories. For example, photographs taken by researchers have been used to study visitor behavior in museums (Braaksma, 1992; Gilman, 1916; Hood, 1986; King & Marshall, 1977; Klein, 1993; Nielsen, 1946) and have been referred to as deferred observations (Braaksma, 1992). Photographs taken by researchers also have been used as a stimulus or part of an activity during interviews to learn more about the museum visit and what was learned or remembered (Anderson & Roe, 1993a, 1993b; Fivush, Hudson, & Nelson, 1984; Perry, 1993; Rosenfeld & Terkel, 1982; Staisey & Needham, 1993; Stevenson, 1991). In addition, photographs taken by researchers have been used to determine visitor satisfaction (Crane, 1988), interest and exhibit impact (Lakota, 1975b), and exhibit preferences (Hammitt, 1978; Thompson, 1992, 1993; Wurtak & Bremner, 1992). Other studies have used photographs taken by visitors to learn about museum visits (Anderson & Roe, 1993a, 1993b; Perry, 1992, 1993; Wolf & Tymitz, 1978). Bitgood et al. (1994) have suggested the need for other methodologies, like photography, to learn more about how visitors learn in museums.

An early study by Gilman (1916) used photographs of visitors looking at objects and reading labels to document the physical effort required for different types of installations and to suggest design criteria that would decrease the amount of museum fatigue from muscular efforts. Nielson (1946) and Hood (1986) suggested the use of time-lapse photography as a method for gathering information about visitor behavior.

The Museum Impact and Evaluation Study (Anderson & Roe, 1993a, 1993b; Perry, 1992, 1993) used a variety of data collection techniques to examine the role of affect in visitor learning. The techniques included using photographs as a stimulus in interviews, asking visitors to sort photographs into categories of their choice as a way of understanding how visitors think about and remember exhibits, and asking 6-10 year olds at the Children's Museum of Indianapolis to photograph exhibits that are interesting to them. The photographs taken by the children showed that they liked exhibits that were related to their prior knowledge or interests and/or actively involved them.

Through observation studies of visitor behavior, Wolf and Tymitz (1978) found that the most frequently photographed objects were large. Rosenfeld and Terkel (1982) used photographs as a stimulus in interviews with children to determine what they experienced and learned. Studies that have examined memories of museum visits (Fivush, Hudson, & Nelson, 1984; Staisey & Needham, 1993; Stevenson, 1991) also have used photographs as a prompt during interviews. Photographs of components in a traveling exhibit (Crane, 1988) were used with potential visitors to determine their interest and suggest areas that needed modification. Lakota (1975b) asked visitors to sort photographs into two piles of exhibits they saw and exhibits they did not see. He found that 40% of the adults and 68.7% of the families were able to correctly classify the pictures. As part of a front-end evaluation, Wurtak and Bremner (1992) asked visitors to sort photographs into categories of exhibits they really liked, liked okay, and did not like and then asked the visitors to talk about the exhibits they really liked. Hammitt (1978) studied visitors' preferences for a bog habitat in the Cranberry Glades Botanical Area in West Virginia by asking some visitors to rate photographs of the area before and after they had seen it and asking other visitors to rate photographs only after. The results showed that the preferences increased after the visit experience.

Visitor Employed Photography (VEP) has been used most often in natural environments as a technique to quantify common perceptions and preferences of recreation visitors (Cherem & Driver, 1983; Schulhof, 1990; Taylor, Sexton, & Czarnowski, 1995). With this technique, what is photographed has been found to vary, depending on the instructions given by the researcher (Cherem & Driver, 1983). In a study by Taylor, Sexton, and Czarnowski (1995), visitors at the Rocky Mountain National Park were asked to photograph 12 scenes that had the most important positive or negative effect on their experience in the park and to maintain a photo log that included the subject, location, and reason for taking. From the more than 2000 photographs obtained, the researchers were able to identify 12 main categories of features and determine that the most often photographed features were mountain vistas, water bodies, wildlife, and management features, identify differences between user groups, and determine that the majority of negative features were the result of human impacts on the park. The results of this study provided critical information for management decisions. These researchers described the advantages of VEP as providing a firsthand look at what is valued, a more objective measure of interests, results from the participants themselves, unobtrusive measures, and does not rely on the potentially inaccurate after-the-fact recall. VEP also was used at the North Carolina Botanical Garden (Schulhof, 1990) to assess visitor response to a native plant habitat exhibit. Visitors were asked to photograph features that they thought were the most interesting or that attracted their attention.

This research study will follow the procedures of VEP and Damico (1985), and those used in a pilot study by the researcher. These procedures include giving verbal instructions for the task and completing the data sheet, as well as training the students on camera use prior to the museum visit.

Summary

Museums are popular institutions that make important contributions to the lifelong learning processes of their visitors. Unfortunately, these visitors are not reflective of our society even though the museum community has made repeated commitments to inclusiveness. Therefore, some members of our society are not equal recipients of the cognitive and affective educational benefits these institutions afford. To further our knowledge about learning in informal settings, this study utilizes photography to examine what middle school students focus their attention on in a natural history museum and how their attention is influenced by a variety of characteristics and factors. Results of this study have implications for both exhibit and program development that can influence inclusiveness and the educational effectiveness of museums.

Hypotheses

Based on the preceding literature review, the following null hypotheses were formulated (all hypotheses were tested at $\alpha=.05$):

1. There is no significant difference in the object or people orientation of the photographs.
2. There is no significant difference in the exhibit hall topic, exhibit location, or exhibit type.
3. There is no significant difference in the object or people orientation of the students based on whether the occasion is a first-time visit or repeat visit to the museum.
4. There is no significant difference in the photographs taken by the students due to the students' gender, race, SES, general achievement, science achievement, or interest in science.

CHAPTER 3
METHODOLOGY

It will be recalled that this study was an extension of a study conducted by Damico (1985) and pilot studies conducted by this researcher in fall, 1992, and spring, 1996 (Appendix A). Damico (1985) used photography as a research tool to determine if pictures taken by Black American and White adolescents reflected differences in the people versus object orientation. These photographs were analyzed to determine who was included in them, the type taken, the location, and the themes.

Subjects from three middle schools (grades 6, 7, and 8) participated in Damico's (1985) study. Two of the schools were in urban areas while one was in a smaller community. A total of 82 students participated in the study; 70 of the students were White and 12 were African American. Only four of the students were female. The disproportionate numbers of White and African American students as well as the disproportionate numbers of males and females in Damico's study suggested the need for further investigation. It also is appropriate to follow a similar methodology in an informal setting and then compare the results with those obtained in the formal setting.

In the Damico (1985) study, the students met with the researcher, instamatic cameras with flash attachments were distributed, verbal instructions for the task were given, and directions for recording the exposure number and photograph title were reviewed. The following verbal instructions were given:

> Pretend you are writing to a pen pal whom you have never met. In your letter you want to describe your school and yourself. You decide that it would help to include a series of photographs. That is what you will be doing today. You will be taking the photographs you would send in your letter. Since I am not familiar with your school, please write on a sheet of paper a description of each picture you take. (Damico, 1985, pp. 213)

Students were paired and each pair had one camera to use throughout the school day. The students received passes that gave them access to all parts of the school. No problems with camera operation were encountered.

A total of 383 photographs were obtained. They represented 79% of the potential photographs taken by White students and 74% of those taken by African American students. The photographs were analyzed in terms of the types of individuals included, location, and topics depicted. The results showed significant differences in the perceptions of school by the African American and White students. Damico (1985) found that the African American students were more responsive to the people in their environment than were the White students. In fact, it was rare for a picture taken by an African American student to not include a person. She also found that the photographs taken by the African American students were more formal, lacked features suggesting a school context, and lacked humor. Damico suggests that these differing perceptions of school are important because of how they may interact with and affect achievement.

As part of the summative evaluation of the Fossil Study Center exhibit at the Florida Museum of Natural History in fall, 1992, photography was used to examine how visitors direct their attention within the exhibit. A systematic space sample of visitors was selected and asked to photograph the three things they liked best in the Fossil Study Center. Participants used 24-exposure, one-time-use flash cameras and photographed fourteen different exhibits or parts of exhibits. The photographs illustrated the variability of visitor attention and provided evidence that large objects and dynamic exhibits attract more attention (Koran, et al, 1983; Bitgood, Benefield, Patterson, & Nabors, 1986; Patterson and Bitgood, 1988).

Another pilot study in spring, 1996, was conducted to assess any problems associated with the study task description, student worksheet, or operation of the one-time-use flash cameras by adolescents in preparation for the present study. The subjects were sixth, seventh, and eighth grade students who came to the museum with adults; these adolescents were not part of a school group. Logistics as well as the worksheet was modified as a result.

In the present study, the following hypotheses were tested:

1. There is no significant difference in the object or people orientation of the photographs.

2. There is no significant difference in the exhibit hall topic, exhibit location, or exhibit type.

3. There is no significant difference in the object or people orientation of the students based on whether the occasion is a first-time visit or repeat visit to the museum.

4. There is no significant difference in the photographs taken by the students due to the students' gender, race, SES, general achievement, science achievement, or interest in science.

Setting

This study was conducted at the Florida Museum of Natural History, Gainesville, Florida, the largest natural history museum in the Southeast, in April, 1996. The permanent and temporary exhibits reflect the museum's collections and research expertise in the natural sciences and anthropology of Florida and the circum-Caribbean. The permanent and temporary galleries (Appendix B) cover more than 17,000 square feet and include static, walk-through, and dynamic exhibits (Koran et al., 1983). There is no introductory/orientation exhibit for the museum and the exhibit halls were developed as independent units. The exhibit halls, in order of their visitation by most museum visitors, are as follows:

a) North Florida Cave--This 3000-square-foot, walk-through exhibit illustrates the geological and biological features of caves found in north Florida in a recreated, composite environment. Five static introductory panels are located in the main hallway, outside the walk-through environment. To simulate the feeling of being in a real cave, the museum cave has low light and an uneven floor, as well as air conditioning positioned to create a cooler environment. Visitors can explore the cave by following a winding path from the entrance to the exit and are able to touch the walls and features throughout. Ten backlit interpretive stations within the cave provide textual information and graphics about geological and biological concepts presented within this environment. This hall is a favorite of many visitors, particularly children.

b) Fossil Study Center--This 1800-square-foot, specimen-rich exhibit contains both dramatic, articulated skeletons and individual specimens, ranging in size from small mollusks to large bones, from the museum's extensive paleontological collections. The exhibit also includes models and panels with text, graphics, and photographs. The Fossil Study Center introduces visitors to the science of paleontology, geologic time, and Florida's rich fossil history. The gallery includes static exhibits (interpretive panels, object cases, skeletons, and models) and dynamic exhibits (five Apple IIe computers and a touch screen computer).

c) Florida Environments--This 2300-square-foot gallery includes interpretive panels, object cases, dioramas, and walk-through environments. The first part of the exhibit has dioramas of a savanna, a coral reef, and a mangrove forest, interpretive panels, and a window through which you can see a temporary pond that is actually at the back of temperate forest in the adjacent room. The second room, which is larger, contains full-scale, walk-through environments of a north Florida temperate forest and a south Florida tropical forest; object cases, and interpretive panels. Small interpretive panels are located around the perimeter of the two forest exhibits. They contain both text and graphics and provide identification of the plants and animals seen within the environments as well as ecological messages.

d) Florida: 40 Million Years Ago--This 1300-square-foot static exhibit recreates in full scale what Florida looked like 40 million years ago, during the Eocene Epoch, when Florida was a shallow, tropical sea. The diorama includes models of a primitive whale (*Zygorhiza kochi*), a nautiloid four feet in diameter (*Aturia*), a primitive sea cow, numerous kinds of bony and cartilaginous fishes, and an array of invertebrates including mollusks unique to this time period. Dramatic, low lighting creates the ambiance of being at the bottom of a shallow ocean. The exhibit also includes interpretive panels and specimen-rich cases that feature the fossil evidence that forms the foundation for recreating this environment. This exhibit opened in fall, 1995, and was built as a prototype for the new Education and Exhibition Center, presently under construction. There it will be an almost 1500-square-foot component in the Hall of Florida Fossils and, in the new hall, is designed as a walk-through environment, rather than a diorama.

e) Maya Civilization--This hall contains 1630 square feet and includes a dramatic walk-through environment that recreates a palace at Palenque and within the palace one of the ceremonial rooms at Bonampak. The palace has sculptures on the outside front wall, carved limestone tablets inside, and paintings within the side doorways that recreate scenes that might have been viewed more than 1000 years ago. Dazzling wall paintings have been recreated in the ceremonial room. This gallery also includes a replica of a large stela, static interpretive panels that explain the palace components, and object cases.

f) Temporary Gallery--This changing gallery is small, 740 square feet, compared to the other halls. At the time of the study, "Wisdom of the Maya: Weaving Traditions of Chiapas, Mexico" was on exhibit. It featured photographs of contemporary Maya people in traditional dress as well as weavings done by them.

g) Object Gallery--This 2700-square-foot exhibit contains thousands of artifacts and specimens from pieces of pottery made by Native Americans thousands of years ago to contemporary African baskets, stone tools to historical items, vertebrate fossils to recent mollusks, study skins of mammals and birds to skeletal materials, and insects to herbarium mounts, in pull-out drawers and wall cases around the perimeter of the gallery. The exhibit also contains interpretive information about these objects, a small number of hands-on artifacts and specimens, a small reference library, two computers, audio-visual materials, hands-on activities such as puzzles, and a small collection of live animals, primarily snakes and turtles.

h) Hall of Florida History--This 1000-square-foot exhibit is located in the main hallway that connects the large temporary gallery, closed during the time of the study, and the Object Gallery. This exhibit contains static interpretive panels, miniature dioramas, and object cases that illustrate the following themes in Florida's history: settlement, life styles, transportation, economy, land boom, and political history.

Subjects

The subjects for this study were 128 seventh grade students from a large middle school in Florida. The School Board attempts to create a racial balance in the student population of middle schools through zoning and busing of students. This school had a population of 1,271 students; 45% of the students were African American (School Board Public Hearing, January 16, 1996). This school was selected because the researcher knew the chairperson of the science department because she had taught museum classes during the summer for many years.

Seventh grade students at this school were randomly assigned to two teams by the guidance office. All students on the "G" team, approximately 150 students, were invited to participate in the study. Both teams were not included in the study due to budget constraints because of the costs of the cameras and film processing. Not all students participated in the museum field trip for a variety of reasons including being absent from school on the field trip day, not returning the permission forms, and prior behavior problems that made the students ineligible to participate in field trips.

This study was approved by the University of Florida Institutional Review Board and the County School Board Research Office. Written parental informed consent (Appendix C) was obtained for each student to participate in the museum field trip and to obtain student information from school records. In addition, each student gave verbal assent to participate in the study. All information was numerically coded, and confidentiality was maintained throughout the study.

Independent Variables

The following characteristics of the students were independent variables for the study: gender, race, SES (socioeconomic status), general achievement, science achievement, interest in science, and visit occasion (whether this was the first visit to the museum or a repeat visit by the student). Gender, race, SES, general achievement, and science achievement were obtained from school records. Students answered questions about interest in science and whether they had visited the museum before on the student worksheet. The worksheet was completed during the museum field trip.

Gender

Gender was a true dichotomous independent variable with the sample of 128 students being divided equally between males and females as is shown in Table 3-1.

Race

Race, in this study, was a dichotomous independent variable with students being designated as either African American, as determined from school records, or White. The 1995-1996 seventh grade student population at the middle school included 49% White students and 44.8% African American students. Because the populations of Hispanic (4.0%), Asian (2.1%), and Native American (0%) students at the school were very small, for the purposes of this study, these students were placed in the White category. (The total percent is 99.9% due to rounding errors.) Future studies should look at the similarities and differences in the object or people orientation among all racial groups. The study participants included 59 African Americans and 69 Whites. There were 31 African American males, 28 African American females, 33 White males, and 36 White females. Table 3-1 shows the frequency of the students by gender and race.

Table 3-1. Frequency for student gender and race.

	African American	White	Total
Male	31	33	64
Female	28	36	64
Total	59	69	128

SES

SES (socioeconomic status) was a categorical independent variable with three categories determined by whether a student received financial assistance for his or her lunch or no assistance. The categories were free lunch, reduced price for lunch, and no lunch assistance. Financial status is determined annually from a formula based on the size of the household and total income. Proof of income and number of household residents must be provided and is audited. More than half of the study participants received free lunches, approximately 10% received reduced price lunches, and almost 40% received no lunch assistance. The frequency and percent for the three SES categories is shown in Table 3-2.

Table 3-2. Frequency and percent for student SES.

SES	Frequency	Percent
Free	66	51.6
Reduced	13	10.2
No assist.	49	38.3

When race and SES are considered, almost 30% of the students are African American and recipients of free lunches and an equal number of students are White and receive no lunch assistance. The next largest group of students, more than 20%, are White and receive free lunches. The frequency and percent of student SES by race is shown in Table 3-3.

Table 3-3. Frequency and percent of student SES by race.

Race	SES	Frequency	Percent
African American	Free	37	28.9
	Reduced	10	7.8
	No assist.	12	9.4
White	Free	29	22.7
	Reduced	3	2.3
	No assist.	37	28.9

When student SES is examined by both race and gender, White females receiving no assistance represent the largest category with more than 16% of the students. Both

African American males and African American females receiving free lunches have more than 14% of the students each. The categories of White males receiving free lunches and White males receiving no lunch assistance each have 12.5% of the students. The frequency and percent of students for all race, gender, and SES categories are shown in Table 3-4.

Table 3-4. Frequency and percent of student SES by race and gender.

Race	Gender	SES	Frequency	Percent
African American	Male	Free	19	14.8
		Reduced	6	4.7
		No assit.	6	4.7
	Female	Free	18	14.1
		Reduced	4	3.1
		No assit.	6	4.7
White	Male	Free	16	12.5
		Reduced	1	.8
		No assit.	16	12.5
	Female	Free	13	10.2
		Reduced	2	1.6
		No assit.	21	16.4

General Achievement and Science Achievement

Reading, language, and math scores from the California Achievement Test provide norm-referenced measures of academic basic skills or general achievement. "The CAT is strong in all areas associated with the construction of a standardized achievement test battery and compares very favorably to other achievement batteries of its genre" (Airasian, 1989, p. 128). The CAT score was a continuous independent variable. Sixth grade scores were used because seventh grade scores were unavailable at the time of the study.

Mid-year science letter grades, on a scale from a high of A+ to a low of F, were used as a measure of science achievement. The grade provided an interval measurement for this independent variable.

Interest in Science

Students were asked to rate their interest in science on a scale of very high, high, neutral, low, and very low (Falk, 1993). Science interest was an interval independent variable. Because this is a self-report measure, results must be interpreted cautiously.

First-time Visit or Repeat Visit

Students were asked to indicate whether their field trip to the museum was their first visit or whether they had visited the museum previously. Visit was a categorical independent variable with students designated as either first-time or repeat visitors.

Procedures

To develop the details and logistics for this study, a series of meetings and telephone conversations took place with the principal, the chairperson of the science department, and the "G" team teachers. The "G" team science teacher ultimately worked most closely with the study.

All the students in the study were brought to the Florida Museum of Natural History during one morning in April, 1996 to eliminate history as a possible threat to the internal validity of the study. The researcher spent one day at the school the week prior to the museum field trip working with all of the "G" team science classes. The presentation to each class was standardized so that instrumentation was not a threat to the internal validity of the study.

After giving verbal consent, the students were advised of the logistics involved. The students were told that they would be placed in one of four groups, that all groups would follow the same procedure but in different orders, the museum activity was described in a very general manner, school departure and return times were noted, and lunch arrangements were outlined.

The researcher explained to the students that they would participate in an activity involving photography and the museum exhibits and that they would be given the specific task description at the museum on the study day. The students were informed that once they were given the task description, they would decide which pictures they would take. It also was explained that they would have one hour to visit all of the museum exhibits and that they could spend time within the exhibits however they chose.

During one class period, a White female asked if the students could take pictures of friends. During a later class period, an African American male and an African American female each asked about taking pictures of friends and an African American female asked if someone else could use her camera to take a picture of her with something. In all instances, the researcher responded that the students would have to interpret what they could do once they received the task description.

The researcher passed out fifteen-exposure, one-time-use flash cameras to the students and went over the directions for using the cameras. Directions were given for completing the student worksheet; how to record the camera picture number on the worksheet was emphasized. The students were informed that double prints would be made for each exposure and that they would be given a copy of the pictures they took at the museum as a "thank you" for participating in the study. It was hoped that knowing that they would receive a copy of the pictures would provide encouragement to the students to follow the study procedures and complete the activity. The students were given two envelops each and asked to put their names on them. One envelop was used to return a copy of the pictures to each student. The other envelop was used to store the subject's photographs for data analysis.

The science teacher divided the students into four groups for the museum field trip. The students were first divided into a stratified sample of African American males, African American females, White males, and White females. They were then assigned to one of the four groups so that, for example, from the alphabetized list of names, the first seven African American females were placed in the blue group, the next seven were placed in the green group, etc. Each group had approximately the same number of African American males, African American females, White males, and White females.

Five museum docents, a member of the museum education staff, the security guard, and the faculty chairperson of this dissertation committee volunteered to help on the study day. Prior to the arrival of the students, this organizational group met to discuss the study procedures and guidelines, and assign the various duties. The chairperson assisted with the overall logistics and coordination in the museum lobby. One docent worked with the students in a hands-on artifact activity that was used as a holding activity for the groups either before or after their participation in the research study activity. The education staff member showed movies in the museum classroom that also were used as a holding activity for the students either before or after participation in the research study activity. The four docents were each assigned exhibit areas to be responsible for and the security guard was asked to move throughout the exhibits. All the study volunteers were asked to make sure that students stayed on task, to assist the students if they had any problems operating the cameras or filling out the data worksheets, and to answer any questions that the students might have as long as their responses did not influence what the students took pictures of.

To reduce crowding in the exhibits, the four student groups were rotated through the research study activity and the two holding activities, the hands-on artifacts and the movies. Appendix D outlines the day's schedule for all of the groups. Both the hands-on artifacts and the movies were of subject matter that had only a very few related artifacts in the Object Gallery. They were selected so that history, being influenced by events that occurred during the course of the study, would not be a threat to the internal validity of the research study for students participating in either the hands-on activity or the movies prior to the research task. Following the museum activities, the students walked to the University of Florida student union to eat lunch and visit the game room prior to returning to school at 1:30 p.m. All of the groups ended up leaving the museum earlier than was planned, by approximately 12:10 p.m., because the teachers were concerned that the students would not have enough time for lunch.

During the first part of the morning, two self-guided groups were also in the museum. They included a group of 60 preschool-kindergarten students from a local school and a group of 55 ninth through twelfth graders from an out-of-county high school.

Each student group was brought into the museum lobby and each student was given a pocket folder containing a camera, student worksheet with the activity description on the back (Appendices E and F), and a pencil. Each camera was numbered and was used by one student at a time. The activity description was read to the students and the directions for completing the student worksheet and operating the camera were reviewed. The students were asked if they had any questions about the activity, cameras, worksheets, or museum. The students were reminded that they would have one hour to visit the exhibits and take six photographs.

The procedures used by Damico (1985) and for the pilot study, as well as the methods used in VEP (Cherem & Driver, 1983; Taylor et al., 1995), were modified as appropriate for the present study. These modifications included limiting the task length to one hour, having only one student assigned to a camera at a time, allowing more room for students to write their picture descriptions, providing the students with a written copy of the task description to keep with them, and adjusting the task description to fit the museum activity. The activity description is as follows:

> Pretend you are writing to a pen pal whom you have never met. In your letter you want to describe your visit to the Florida Museum of Natural History. You decide that it would help to include a series of photographs. That is what you will be doing today. You will be taking 6 photographs in the museum that you would send in your letter. Please write on the worksheet a description of each of the 6 pictures you take.

The students could visit as few or as many of the exhibits as they wished and take pictures in as few or as many different places within the exhibit halls as they wished. The folders were collected at the end of the activity time. As the students were turning in their folders, some students in all of the groups had to be asked to complete the written descriptions of the pictures.

Dependent Variables

The following dependent variables were examined: exhibit hall, specific exhibit by subject, orientation by subject, specific exhibit by reviewer, orientation by reviewer, location, and exhibit type. This categorical information was determined from the photographs themselves and the student descriptions of the photographs. This information was recorded for each of the six photographs taken by each study participant on a data sheet as shown in Table 3-5.

Table 3-5. Data recording format for each of the photographs.

Photograph	1	2	3	4	5	6
Exhibit hall						
Specific exhibit by subject						
Orientation by subject						
Specific exhibit by reviewer						
Orientation by reviewer						
Location						
Exhibit type						

Guidelines were established for coding the object or people orientation of each picture. A picture was coded people if it appeared that a person was included in the photograph on purpose. A picture was coded object if there were no people in the photograph or if people were present but did not appear to be a planned part of the photograph. To establish the consistency of the rating methods, a test of inter-rater reliability was conducted with two volunteers.

Using a random numbers table, 20 photographs were selected to use as a practice session with the two raters. The guidelines were presented, any questions about the rating procedures were discussed, and then the photographs were rated. The reliability for this practice session was 1.0, with all of the pictures receiving the same rating. The random numbers table was used to pick 50 photographs to determine the actual inter-rater reliability for this scoring. Forty-nine out of the 50 photographs were rated the same for an inter-rater reliability of .98. It is interesting to note that while one of the raters had visited the museum on numerous occasions, the other rater had only visited the North Florida Cave exhibit on one occasion so familiarity with the exhibits was definitely not a factor in determining the object or people rating of the photographs.

To keep track of the photographs and their corresponding data, a numbering system was developed that included the cameras, subjects, and photographs. Each camera was assigned a number from 1 through 68. Each subject was assigned the number of the camera they used, followed by either a 1 or 2 depending on whether they were the first person or second person to use the camera. Each of the six photographs taken by each student was assigned the student number plus a number 1 through 6 according to the order in which the photograph was taken with the first picture taken being assigned number 1, the second 2, etc. Thus the number 2514 on a photograph would mean that camera 25 was used, by the first person, and this is the fourth picture taken. Thus, the number on the photograph was the camera number (1-68), followed by the subject number (1 or 2), followed by the order of the photograph (1-6). In this manner, all the photographs were numbered and by looking at the number, it could be determined who took the photograph, whether they were the first or second user of the camera, and where in the sequence the picture was taken. A data worksheet was completed for each subject and the information was entered in the computer statistical program worksheet. All categories were assigned numerical values. If data was missing, it was coded as 9999.

Exhibit Hall

Exhibit hall was determined from the written student description. The exhibit halls include the North Florida Cave, Fossil Study Center, Florida Environments, Florida - 40 Million Years Ago, Maya Civilization, small Temporary Hall, Object Gallery, and Hall of Florida History.

Specific Exhibit by Subject

Specific exhibit by subject was determined from the written student description. A list of individual exhibits was created from the descriptions and each exhibit was assigned a number for coding purposes.

Orientation by Subject

The orientation by subject was either object or people and was determined from the written student description.

Specific Exhibit by Reviewer

Specific exhibit by reviewer was determined by examining the photograph. In some cases, this was different from the exhibit by subject designation because the students were inaccurate in their descriptions of what they took pictures of. For example, the giant ground sloth skeleton might be called a dinosaur. There also might be missing values because the photograph did not turn out. Thus, for some photographs there was a value for exhibit by subject but not exhibit by reviewer. The same exhibit list was used as for specific exhibit by subject.

Orientation by Reviewer

Orientation by reviewer was either object or people and was determined by examining the photograph. In some cases, this might also be different from the orientation by subject designation. The most common difference was that people were included in the picture but not included in the subject's description of the picture. If the photograph did not turn out, there was a missing value for this category.

Location

Location was determined from the written student description. The museum was divided into three parts. The North Florida Cave and the Fossil Study Center were considered to be located in part one. The Florida Environments, Florida: 40 Million Years Ago, and the Maya Civilization exhibits were located in part two. The small Temporary Gallery, the Object Gallery, and the Hall of Florida History were in part three.

Exhibit Type

Exhibit type was static, dynamic, or walk-through and was determined from the written student description. Static exhibits include panel exhibits, specimen and artifact cases, the live snakes and turtles, and the Florida: 40 Million Years Ago diorama. Dynamic exhibits include the bears, computers, alligator, and the satellite orbit. Walk-through exhibits include the North Florida Cave, Temperate and Tropical Forests, and the Maya Palace.

Data Analysis

Chi-square tests of significance were conducted for hypotheses one, two, and three. Multiple regression, because of its ability to work with interval and categorical data, was used to determine the object/people relationships among the dependent variable (the photographs taken by the students) and the independent variables (gender, race, SES, general achievement, science achievement, and interest) for hypothesis four. This analysis provided estimates of both the magnitude and statistical significance of the relationships among the variables, thus identifying those factors that can be combined to help explain and form the best prediction of the types of photographs taken by the students.

CHAPTER 4
RESULTS

The 128 students that participated in the study took a total of 667 photographs. These photographs, along with the student worksheets and the student data obtained from school records, were analyzed and each of the null hypotheses were tested. The corresponding results are described below.

Hypothesis 1

To evaluate Hypothesis 1: There is no significant difference in the object or people orientation of the photographs, Chi-square tests of significance with Yates Correction for Continuity were conducted. Out of the 768 photographs that could have been taken by the students (128 subjects x 6 photographs each = 768 photographs), 667 photographs were developed. This difference between the total possible number of pictures and the actual number of usable, printed pictures is due to students not using the cameras properly, the pictures taken being so dark that the images could not be identified, or the students not taking all of their six pictures.

Students were asked to record what they took pictures of on the student worksheets and these worksheets provide information about 736 pictures out of the total possible 768 pictures. Students did not provide written descriptions for 32 of the pictures. The 101 missing photographs and the 32 missing student descriptions were coded as missing data. Thus the discrepancy among the numbers for possible photographs, printed photographs, and student descriptions is due to incomplete data. Table 4-1 gives the total possible number of photographs, the actual number of photographs obtained, and the number of student descriptions recorded for photographs.

Table 4-1. Student photographs.

Total possible number of photographs	768
Total number photographs obtained	667
Total number student descriptions for photographs	736

The 667 photographs obtained were analyzed for their object or people orientation and the frequency and percent for each category are shown in Table 4-2. A picture was coded object if there were no people in the photograph or if people were present but did not appear to be a planned part of the photograph, while a picture was coded people if it appeared that a person was included in the photograph on purpose. The students took 579 object photographs compared to only 88 people photographs and for hypothesis 1 these results (361.442) were significant at $\alpha = .05$ and df = 1 for the photographs rated for object or people orientation.

Table 4-2. Frequency and percent of object or people orientation of the photographs.

	Frequency	Percent
Object	579	86.8
People	88	13.2
Total	667	100.0

The student descriptions of the photographs also were examined to determine the object or people orientation and were coded object if no mention was made of a person in the description or people if a person was mentioned in the description. Out of the 736 descriptions, 695 were coded object and 41 were coded people. When a Chi-square test of significance with Yates Correction for Continuity was conducted for the object or people orientation of the descriptions, the results (581.137) were significant at $\alpha = .05$ and df = 1. Table 4-3 gives the frequency and percent for the object or people orientation of the student descriptions of the photographs.

Table 4-3. Frequency and percent of object or people orientation from the student descriptions of the photographs.

	Frequency	Percent
Object	695	94.4
People	41	5.6
Total	736	100.0

Table 4-4 shows the frequency for the object orientation, people orientation, and missing data for the photographs themselves and the student descriptions of the photographs.

Table 4-4. A comparison of the frequency of the object or people orientation for the photographs and subject descriptions.

	Photograph	Description
Object	579	695
People	88	41
Missing Data	101	32
Total	768	768

Thus when either the actual photographs or student descriptions were examined, there was a significant difference in the object or people orientation and Hypothesis 1, which said no difference in the orientation, is rejected. In fact, 86.8% of the photographs were coded object compared to 13.2% coded people. This difference becomes even greater for the student descriptions of the photographs with 94.4% coded object and only 5.6% coded people. When the numbers of photographs and student descriptions having people orientation are compared, there were more than twice as many photographs (88) with this designation as there were student descriptions (41). These results show that the student descriptions often did not reflect that people were included in the photographs.

Out of the six photographs taken by each subject, the number of people photographs ranged from none with a people orientation to four photographs with a people orientation. A total of 53 students, or 41.4% of the total number of subjects, had one or more photographs that were rated as people while 75 students, or 58.6% of the total number of subjects, did not take any photographs that included people in them. A comparison of the frequency and percent of students who included people in one or more of their photographs with those who had an object orientation for all their photographs is shown in Table 4-5.

Table 4-5. A comparison of the frequency and percent of students who had all their photographs coded object with those who had one or more photographs coded people.

	Frequency of Students	Percent of Students
Object	75	58.6
People	53	41.4
Total	128	100.0

When the photographs were further examined by racial and gender categories, it was found that 15 African American males, 48.4% of the total number of African American males, and 14 African American females, 50% of the total number of African

American females, took one or more people photographs as compared to 11 White males, 33.3% of the total number of White males, and 13 White females, 36.1% of the total number of White females. Table 4-6 shows the frequency and percent of subjects, by racial and gender categories, who had one or more people photographs.

Table 4-6. Frequency and percent of subjects, by racial and gender categories, with one or more people photographs.

	Frequency for people photos	Total frequency	Percent of total
African American male	15	31	48.4
African American female	14	28	50.0
White male	11	33	33.3
White female	13	36	36.1
Total	53	128	41.4

Hypothesis 2

To evaluate Hypothesis 2: There is no significant difference in the exhibit hall topic, exhibit location, or exhibit type, Chi-square tests of significance were conducted. There are eight different exhibit halls where the students could take photographs and these halls included the North Florida Cave, Fossil Study Center, Florida Environments, Florida: 40 Million Years Ago, Maya Civilization, Temporary Gallery, Object Gallery, and Hall of Florida History. The results (242.39) of the Chi-square test of significance for exhibit hall topic were significant at $\alpha = .05$ and df = 7. The exhibit hall topics were determined by examining the student descriptions of the photographs. Because of missing data and because some photographs were taken in a location in the museum other than the eight exhibit halls, the total number of photographs analyzed is 724. Table 4-7 shows the frequency and percent of photographs for each exhibit hall as determined from the student descriptions.

Table 4-7. Frequency and percent of photographs for each exhibit hall as determined from the student descriptions.

Exhibit Hall	Frequency	Percent
North Florida Cave	112	15.5
Fossil Study Center	186	25.7
Florida Environments	79	10.9
Florida: 40 Million Years Ago	93	12.9
Maya Civilization	51	7.0
Temporary Gallery	5	0.7
Object Gallery	139	19.2
Hall of Florida History	59	8.2
Total	724	100.0

The greatest number of photographs, more than 25% of the total number, were taken in the Fossil Study Center and the next highest number of photographs, almost 20%, were taken in the Object Gallery. These two exhibits accounted for approximately 45% of the photographs. More than 15% of the total number of photographs were taken in the North Florida Cave and more than 10% of the photographs were taken in both the Florida Environments and Florida: 40 Million Years Ago exhibits. Compared to the other exhibits, few photographs were taken in the Temporary Gallery (5 photographs), Maya Civilization (51 photographs), and Hall of Florida History (59 photographs).

The exhibit location for the photographs also was determined from the student descriptions. The three categories of exhibit location are Location 1 that includes the North Florida Cave and Fossil Study Center, Location 2 that includes Florida Environments, Florida: 40 Million Years Ago, and Maya Civilization, and Location 3 that includes the Temporary Gallery, Object Gallery, and Hall of Florida History. A Chi-square test of significance for exhibit location was significant (20.33) at $\alpha = .05$ and df = 2. Because some photographs had missing data, the total number of photographs analyzed is 735. The greatest number of photographs were taken in the first part of the museum and the smallest number of photographs were taken in the last part of the museum. More than 40% of the photographs were taken in Location 1, more than 30% of the photographs were taken in Location 2, and less than 30% of the photographs were taken in Location 3. Table 4-8 shows the frequency and percent of the photographs for each exhibit location as determined from the student descriptions of the photos.

Table 4-8. Frequency and percent of photographs for each exhibit location, from the student descriptions.

Location	Frequency	Percent
1	301	41.0
2	228	31.0
3	206	28.0
Total	735	100.0

And, the exhibit type for each photograph was determined from the student descriptions of the photographs. The three categories for exhibit type are static, dynamic, and walk-through. Static exhibits include panel exhibits, specimen and artifact cases, the live snakes and turtles, and the Florida: 40 Million Years Ago diorama. Dynamic exhibits include the bears, computers, alligator, and the satellite orbit. Walk-through exhibits include the North Florida Cave, Temperate and Tropical Forests, and the Maya Palace. A Chi-square test of significance for exhibit type was significant (302.4) at $\alpha = .05$ and df = 2. Because some of the photographs had missing data, the total number of photographs analyzed was 735. More than 60% of the photographs were of static exhibits, almost 30% were of walk-through exhibits, and approximately 10% were of dynamic exhibits. Table 4-9 shows the frequency and percent of photographs for each exhibit type as determined from the student descriptions.

Table 4-9. Frequency and percent of photographs for each exhibit type, from the student descriptions.

Exhibit Type	Frequency	Percent
Static	455	61.9
Dynamic	77	10.5
Walk-through	203	27.6
Total	735	100.0

The pictures that the students took were examined to determine which specific exhibits in each hall were photographed the most. Eleven exhibits were photographed more than twenty times each and the three most photographed exhibits were the shark jaw in the Fossil Study Center (68 photographs), the bears in the Object Gallery (63 photographs), and the diorama in Florida: 40 Million Years Ago (47 photographs). Other exhibits that were photographed more than twenty times each were the raccoon and cave study in the North Florida Cave, the *T. rex* and the sloth in the Fossil Study Center, the temperate hammock in Florida Environments, the whale in Florida: 40 Million Years Ago, the Bonampak Room in the Maya Civilization, and the live snakes in the Object Gallery. Table 4-10 shows the frequency of photographs for each exhibit that was photographed more than twenty times each as determined from the photographs themselves.

Table 4-10. Frequency of photographs for each exhibit that was photographed more than 20 times.

Exhibit Hall	Exhibit	Frequency
North Florida Cave	Raccoon	24
	Cave study	23
Fossil Study Center	*T. rex*	25
	Shark jaw	68
	Sloth	25
Florida Environments	Temp. hammock	24
Florida: 40 Million Years Ago	Diorama	47
	Whale	21
Maya Civilization	Bonampak	24
Object Gallery	Bears	63
	Live snakes	25

Hypothesis 3

On the student worksheet, students were asked to indicate whether they had visited the Florida Museum of Natural History before by checking either yes or no. This information along with the object or people orientation for each subject was analyzed to determine if there was a relationship between prior visit/no prior visit and orientation. A Chi-square test of significance with Yates Correction for Continuity was conducted for Hypothesis 3: There is no significant difference in the object or people orientation of the students based on whether the occasion is a first-time visit or repeat visit to the museum. If the students had one or more people photographs, they were given a people orientation rating while if the subjects had no people photographs, they were given the object orientation rating. The results (0.74) of the Chi-square test were not significant at $\alpha = .05$ and df = 1. Thus there was no relationship between first-time visit/repeat visit and the object/people orientation. The frequency for prior visit/no prior visit and object/people orientation categories is shown in Table 4-11.

Table 4-11. Frequency for prior visit/no prior visit and object/people orientation categories.

	Prior Visit	No PriorVisit	Total
Object	54	18	72
People	44	9	53
Total	98	27	125

Hypothesis 4

Multiple regression analysis, because of its ability to work with a number of variables as well as interval and categorical data, was used to test Hypothesis 4: There is no significant difference in the photographs taken by the students due to the students' gender, race, SES, general achievement, science achievement, or interest in science. Multiple regression examines the relationships among the dependent variable, the photographs taken by the students, and the independent variables, the students' gender, race, SES, general achievement, science achievement, and interest in science. It provides estimates of the magnitude and statistical significance of the relationships among the variables and thus can identify those independent variables that are the best predictors for the types of photographs taken by the students.

The summary table in Table 4-12 shows that Race 1, African American, compared to Race 2, White, and SES 2, reduced lunch status, compared to SES 3, no lunch assistance, are the only variables that are statistically significant at $\alpha = .05$ as yes/no predictors for having people included in the students' photographs. African American students are more likely than White students to include people in their photographs while reduced lunch status students are less likely than no lunch assistance students to include people in their photographs.

Table 4-12. Summary of regression analysis for predicting the people orientation of the photographs.

Parameter	Estimate	Standard Error of Estimate	T for HO: Parameter = 0	PR > |T|
Intercept	0.3674770097	0.23914893	1.54	0.1276
Gender 1	0.0152616673	0.10805740	0.14	0.8880
2	0.0000000000	-	-	-
Race 1	0.2551002333	0.11871436	2.15	*0.0341
2	0.0000000000	-	-	-
SES 1	-.1597073075	0.10856255	-1.47	0.1445
2	-.4709021447	0.17661543	-2.67	*0.0090
3	0.0000000000	-	-	-
Science	-.0045314829	0.05022423	-0.09	0.9283
Reading	0.0036558699	0.00315239	1.16	0.2490
Language	0.0025104978	0.00349705	0.72	0.4745
Math	-.0049968691	0.00327715	-1.52	0.1305
Interest	0.0039294044	0.05395213	0.07	0.9421

* = significant results ($\alpha = .05$)

Table 4-13 shows the frequency, percent, cumulative frequency, and cumulative percent for the object and people orientation.

Table 4-13. Frequency and percent of object and people orientations.

Orientation	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Object	75	58.6	75	58.6
People	53	41.4	128	100.0

When just the people orientation is considered with the students taking from zero to four photographs that include people, Race 1, African American, compared to Race 2, White, and SES 2, reduced lunch status, compared to SES 3, no lunch assistance, are the only variables that are statistically significant at $\alpha = .05$. African American students take more photographs that include people than do White students. In contrast, reduced lunch status students take fewer photographs that include people than do no lunch assistance students. The summary table for this regression analysis is shown in Table 4-14.

Table 4-14. Summary of regression analysis for predicting from zero to four photographs that included people.

Parameter	Estimate	Standard Error of Estimate	T for HO: Parameter = 0	PR > | T |
Intercept	0.4497923253	0.49386049	0.91	0.3647
Gender 1	-.1369995332	0.22314664	-0.61	0.5407
2	0.0000000000	-	-	-
Race 1	0.5980546665	0.24515405	2.44	*0.0165
2	0.0000000000	-	-	-
SES 1	-.1691241004	0.22418981	-0.75	0.4524
2	-.7960830107	0.36472412	-2.18	*0.0314
3	0.0000000000	-	-	-
Science	0.0139680989	0.10371681	0.13	0.8931
Reading	0.0067448713	0.00650992	1.04	0.3027
Language	0.0007834227	0.00722167	0.11	0.9138
Math	-.0015005077	0.00676757	-0.22	0.8250
Interest	-.0067408402	0.11411519	-0.06	0.9519

* = significant results ($\alpha = .05$)

More than 21% of the students (27 students) took only one photograph that included people, more than 13% of the students (17 students) took two photographs that included people, more than 5% of the students (7 students) took three photographs that included people, and less than 2% of the students (2 students) took four photographs that included people. The frequency, percent, cumulative frequency, and cumulative percent of students who took no photographs with people in them and students who took from one to four photographs with people in them are shown in Table 4-15.

Table 4-15. Frequency and percent of subjects who took from zero to four people photographs.

# Object Photos	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	75	58.6	75	58.6
1	27	21.1	102	79.7
2	17	13.3	119	93.0
3	7	5.5	126	98.4
4	2	1.6	128	100.0

Summary

The photographs taken by the students, student worksheets, and student data obtained from school records were analyzed to test the four null hypotheses. Three of the hypotheses were rejected because significant differences were found. For Hypothesis 1, there was a significant difference in the object or people orientation of the photographs with almost 87% of the photographs having an object orientation and 13% of the photographs having a people orientation. For Hypothesis 2, there was a significant difference in the exhibit hall topic, exhibit location, and exhibit type of the photographs. Out of the eight exhibit halls, approximately 45% of the photographs were taken in two exhibit halls and few photographs were taken in three exhibit halls. In terms of the location within the museum, the largest number of photographs were taken in the first part of the museum and the smallest number of photographs were taken in the last part of the museum. When exhibit type was examined, more than 60% of the photographs were of static exhibits while approximately 10% of the photographs were of dynamic exhibits. For Hypothesis 3, there was no significant difference in the relationship between first-time visit/repeat visit and the object/people orientation. For Hypothesis 4, out of the independent variables examined including the students' gender, race, SES, general achievement, science achievement, and interest in science, African American compared to White for race and reduced lunch status compared to no lunch assistance were significant. African American students took more people photographs than did White students while reduced lunch status students took fewer people photographs than students with no lunch assistance.

CHAPTER 5
DISCUSSION

Photography was used in this study as a research tool to quantify and qualify how African American and White adolescents directed their attention in a natural history museum. Attention is of interest because of its importance as the first step in the learning process and the transfer of information from a stimulus to memory (Koran et al., 1983). Thus, if students are to learn from objects, they must first focus their attention on them. However, there are differences in attention among students and variables that account for these differences are explored using the framework developed by Koran and Koran (1986) that is shown in Figure 2-2. This framework incorporates the learning and memory model as its foundation but in addition simultaneously considers the characteristics of visitors, visitor processing activities, characteristics of exhibits, and desired outcomes. Photographs taken by middle school students in the Florida Museum of Natural History were analyzed for their object or people orientation and these results, along with student worksheets, were examined in relation to the characteristics of the students and the characteristics of the museum exhibits.

Specifically, this study was designed to explore (a) the extent attention, in natural history museums, is focused on objects and exhibits as opposed to other visitors; (b) the extent attention, in natural history museums, is affected by the exhibit hall topic, exhibit location within the museum, and exhibit type; (c) the extent attention, in natural history museums, is affected by whether the occasion is a first-time visit or repeat visit to the institution; and (d) the extent attention, in natural history museums, is affected by gender, race, socioeconomic status, general achievement, science achievement, or interest in science. The findings for each null hypothesis tested in this study are discussed below.

Hypothesis 1: There Is No Significant Difference in the Object or People Orientation of the Photographs.

When middle school students were given the task of pretending that they were writing to a pen pal, whom they had never met, about their visit to the Florida Museum of Natural History and that they would include six photographs that they took during their museum visit with their letters, significant differences were found in the object or people orientation of the photographs taken by the students. In fact, more than 86% of the photographs had an object orientation, while only 13% of the photographs had a people orientation. As a comparison to the object or people orientation of the actual photographs, the student descriptions of their photographs also were analyzed, and an even greater percent, almost 95%, of the student descriptions had an object orientation while only 5% had a people orientation.

These findings demonstrate that the focus of attention by adolescent students is on objects and exhibits as opposed to other people, thus reiterating the primary role objects play as the foundation of museums, their centrality to exhibits, and their importance to museum visitors which has already been described by numerous authors (e.g. Beer, 1987a; Gartenhaus, 1991; Graburn, 1977; Hooper-Greenhill, 1991; Pitman-Gelles, 1985; Resnicow, 1994). Falk and Dierking (1992, p. 67) describe this importance as ". . . it is generally assumed that objects and labels have the greatest influence on the visitor's museum experience." When the learning and memory model (Koran et al., 1983) is considered, because attention is focused on objects, it is assumed that students are learning from these objects.

Thus, in terms of the task given the students, more attention was focused on objects than on people. However, even though many of the photographs that were taken by the students may be of the same objects, very different kinds of learning are occurring among the students because of differences in the characteristics of these students such as prior knowledge, interests, and cognitive ability (Alt & Griggs, 1984; Bitgood, Serrell, & Thompson, 1994; Duckworth, 1990; Esteve-Coll, 1993; Falk & Dierking, 1991, 1992, 1995; Gartenhaus, 1991; Greenglass, 1986; Koran & Koran; 1986; Korn, 1991; McManus, 1993; Pitman-Gelles, 1985; Shettel, 1973; Weil, 1990). Dierking, Falk, and Abrams (1996, p. 20) describe this as ". . . museum experiences almost always result in learning, but the character and content of that learning is highly variable."

The number of people photographs however do provide evidence that the museum visit was a social occasion for these adolescents; and many researchers discuss the importance of the social aspects of the museum visit (e.g. Carlisle, 1985; Dierking, 1991; Falk, 1988; Falk & Dierking, 1992; Gottfried, 1979, 1980; Litwak, 1993). Jenson (1995) conducted interviews with 9-10-year-old children to explore how they describe and evaluate their experiences in museums in comparison with other places they go and found that the categories children used were organized by quality descriptors, when they go, and social context. The categories that children used were influenced by a wide range of factors but personal interests and family and cultural background were found to be the most important.

Hypothesis 2: There Is No Significant Difference in the Exhibit Hall Topic, Exhibit Location, or Exhibit Type.

In contrast to the formal school setting where the classroom learning conditions are prescribed, organized and sequenced, and standardized for all students, seventh grade students participating in this field trip to the Florida Museum of Natural History were given the opportunity to visit the exhibits on their own and select what they wanted to photograph, depending on how they interpreted the task description. Thus the learning in this informal setting was free choice and how time was spent and what was photographed varied among the students (Bitgood, 1988; Bitgood, Serrell, & Thompson, 1994; Crane, 1994; Falk, Koran, & Dierking, 1986; Koran & Shafer, 1982; Laetsch, Diamond, Gottfried, & Rosenfeld, 1980; Linn, 1983; McManus, 1992; Munley, 1987; Screven, 1969, 1986, 1988; Templeton, 1988). In fact, there were significant differences in the exhibit hall topic, exhibit location, and exhibit type shown in the photographs taken by the students. The framework by Koran and Koran (1986) that incorporates the characteristics of exhibits, as well as the characteristics of visitors and visitor processing activities, provided a means for examining these differences.

For example, one student who I knew as a fairly frequent visitor of this institution returned very quickly to turn in his camera and student worksheet. When I asked him if he had taken his pictures and how he had completed the task so quickly, he replied that he already knew exactly what he wanted to photograph. He then left with friends to go back into the exhibits so that they could spend time looking at the various halls. Thus for this student, his characteristics, including many previous visits and prior interests both in the museum and specific exhibits, affected how he focused his attention and therefore how he completed the task.

Another student took his first five pictures as overviews of exhibit halls in contrast to the pictures of individual objects or exhibits that the rest of the students took. Examination of the student worksheets revealed that some of the students were very precise in their descriptions of their photographs and copied text from labels including scientific names or exhibit titles (e.g. *Thinobadistes segnis*, genetic variation in animals, tropical hammock plants and animals, archaeocete whale) while other students wrote descriptions of the photographs that were incomplete, inaccurate, or off-task (e.g. big toothed thing, Detroit's mom (the cape buffalo head), the roof of a funky little house for the Bonampak Room, or dinosaur for the giant ground sloth).

There are eight exhibit halls where the students could take their photographs and the characteristics of these exhibits including the topics, location, exhibit type, and characteristics of the objects, such as size and movement, must be considered. The greatest number of photographs, more than 25% of the total number, were taken in the Fossil Study Center and the next highest number of photographs, almost 20%, were taken in the Object Gallery. Thus, these two exhibits account for approximately 45% of the photographs taken by the students. Both exhibits are specimen-rich and each contain some of the most photographed exhibits such as the shark jaw, sloth, and *T. rex* skull in the Fossil Study Center and the bears and live snakes in the Object Gallery. In fact, the two most photographed objects were the shark jaw with 68 photographs and the bears with 63 photographs. More than 15% of the total photographs were taken in the North Florida Cave exhibit and more than 10% of the photographs were taken in both the Florida Environments and Florida: 40 Million Years Ago exhibits. In comparison, few photographs were taken in the Temporary Gallery, Maya Civilization, and Hall of Florida History. The other exhibits that were photographed the most included the raccoon and cave study in the North Florida Cave, the temperate hammock in Florida Environments, the diorama and whale in Florida: 40 Million Years Ago, and the Bonampak Room in the Maya Civilization. These photographs are of exhibits that have characteristics that have been shown to draw visitor attention; the exhibits were large (the shark jaw, sloth, *T. rex* skull, whale) (Wolf & Tymitz (1978) observed visitors photographing large objects), dramatic (temperate hammock, diorama in Florida: 40 Million Years Ago, Bonampak Room), easy to relate to (raccoon, person in cave study), touchable (bears), or live animals (snakes).

The most photographs (41%) were taken in the first part of the museum in the North Florida Cave and Fossil Study Center exhibits while the smallest number of photographs (28%) were taken in the last part of the museum in the Temporary Gallery, Object Gallery, and Hall of Florida History. These results are probably due to a combination of factors including museum fatigue which suggests less attention is paid to exhibits as the museum visit progresses (Melton, 1935; Taylor, 1986) and architectural location (Koran & Shafer, 1982; Lakota, 1975b; Lakota & Kanter, 1976; O'Hare, 1974) which suggests that more attention is paid to exhibits that are located near the entrance or are more accessible. Or, the students may have used up the limited number of pictures they had to take early in their visit. Also important in this particular study are that the Temporary Gallery is a small exhibit hall and the Maya photographs and textiles that were on exhibit are probably of less interest to the students. Similarly, the Hall of Florida History is located in the main hallway that goes from the Object Gallery toward the museum lobby and thus contains smaller objects as well as smaller-scale dioramas than are found in the other exhibit halls and this exhibit contains more text. Thus, while museum fatigue and physical location are certainly important in determining how visitors direct their attention during a museum visit and their effects can be observed in photographs taken by visitors, other factors specific to individual exhibit halls, such as size, location, proximity, and context, are critical and must be considered for each separate institution when interpreting any results.

More than 60% of the photographs taken by the students were of static exhibits, while almost 30% were of walk-through exhibits, and 10% were of dynamic exhibits. These results are probably more the product of the kinds of exhibits found at the Florida Museum of Natural History than any other factors. This museum contains many specimens, several of which are large and/or spectacular such as the shark jaw, sloth, *T.rex* skull, and whale, and this museum also is known for its walk-through environmental exhibits including the North Florida Cave, temperate hammock, and Maya Palace. In contrast though, the museum contains few dynamic exhibits which are popular in other institutions, particularly with children. The dynamic exhibits that were photographed the most were the touchable bears and alligator. These results provide evidence that static exhibits attract attention even though they do not provide opportunities for physical participation (Bitgood, 1994a). But on the other hand, the results also suggest that the Florida Museum of Natural History could incorporate more interactive exhibits for visitors to utilize.

Further research could explore how the exhibit hall topic, exhibit location, or exhibit type included in the photographs might vary as a function of the task description.

Hypothesis 3: There Is No Significant Difference in the Object or People Orientation of the Students Based on Whether the Occasion is a First-Time Visit or Repeat Visit to the Museum.

Again, the framework (Koran & Koran, 1986) was utilized to examine this hypothesis with visitation being a characteristic of the students, the orientation being the product of a visitor processing activity or attention, and the characteristics of the exhibits influencing attention as does the characteristics of the visitors. No relationship was found between first-time visit/repeat visit and the object/people orientation in the museum setting.

Prior to the students' field trip to the Florida Museum of Natural History, a classroom visit made by the researcher prepared the students for the day's activities in terms of a general description of the museum and what the students would be doing as well as the logistics of the schedule. Even though the students did not know the specific task that they would be doing, they did know it involved taking pictures and that they would be given a copy of the pictures that they took. This pre-trip preparation incorporated many of the factors that have been suggested as important in contributing to the educational effectiveness of field trips including preparing students, structuring activities, motivating students, and providing students with feedback (Bitgood, 1989; Bitgood, 1993b; Koran & Baker, 1978; Koran, Koran, & Ellis, 1989; Linn, 1980; Price & Hein, 1991). The pre-trip preparation probably decreased any novelty effects that might have been observed between students who had visited the museum before and those who had not, and decreased the amount of off-task behavior (Balling & Falk, 1982; Falk, 1983b; Falk & Balling, 1982; Falk, Martin, & Balling, 1978; Martin, Falk, & Balling, 1981).

Hypothesis 4: There Is No Significant Difference in the Photographs Taken by the Students Due to the Students' Gender, Race, SES, General Achievement, Science Achievement, or Interest in Science.

As described earlier, more than 86% of the photographs (579 photographs) taken by the middle school students at the Florida Museum of Natural History had an object orientation while only 13% of the photographs (88 photographs) had a people orientation. Therefore, these results confirm the importance of objects in museums and affirm the tremendous impact that these objects have on the visitor's museum experience (Falk & Dierking, 1992; Melton, 1935). The Koran and Koran framework (1986) was utilized to determine how the outcome, the photographs, was affected by the characteristics of the students and how they direct their attention.

The students were compared by whether or not they took any photographs with people in them and it was found that more than 58% of the students (75 students) did not take any photographs with people in them, these students had an object orientation only, in contrast to 41% of the students (53 students) who took one or more photographs with people in them. A variety of variables, including the students' gender, race, SES, general achievement, science achievement, and interest in science, were investigated to determine if one or more of these variables resulted in a significant difference in the object or people orientation of the photographs. Regression analysis was the statistical procedure used to examine the research hypothesis and revealed that from these variables, two were statistically significant. African American students took more people photographs than White students while reduced lunch status students took fewer people photographs than no lunch assistance students. Both Oakes (1990) and Shade (1982) have discussed the people, as opposed to object, orientation of African Americans and the implications this may have for academic success in the object-oriented formal school setting. This study demonstrates that African Americans have a people orientation in object-rich informal settings as well. The object or people orientation may suggest important implications for informal settings because there are differences in the focus of attention by students with different characteristics and thus all students are not equal recipients of the educational opportunities afforded by these informal settings.

Only 13 students had reduced lunch status compared to 66 students who received free lunches and 49 students who received no lunch assistance. The findings that the reduced lunch students took fewer people photographs than the no lunch assistance students must be viewed cautiously because there may have been too few students in the reduced lunch category to get a stable estimate.

The differences in the object or people orientation of African American and White adolescent students found in this study parallel the findings of Damico (1985). In a study that examined student perceptions of school, Damico found that when middle school students were given the task of taking photographs in their school to include with a pretend letter to a pen pal about their school, the photographs taken by the White students had an object orientation while those photographs taken by the African American students had a people orientation. The object or people orientation of the photographs in both this study and Damico's demonstrate differences in the ways adolescents direct their attention and these differences may interact with the school curriculum and thus affect school achievement (Damico, 1985) in the formal setting or interact with educational opportunities available in informal settings and result in differences in the educational benefits obtained. Therefore, the characteristics of students, including their cultural backgrounds (Herrmann & Plude, 1995; Ogbu, 1995), must be considered when developing exhibits and programs for informal settings because of the ways they can influence attention, and subsequently learning outcomes (Koran & Koran, 1986). This approach supports the museum community's emphasis on "excellence and equity" (AAM, 1992). In addition, a more compelling approach might be to provide activities that prepare visitors to be comfortable with and learn from object-rich environments.

Summary

Photography was used in this study to quantify and qualify how students directed their attention in a natural history museum and was found to be an extremely valuable research tool. The advantages it affords were described by Taylor et al. (1995) and in the case of this study included providing a product of the students' attention that the students produced themselves, while at the same time being an unobtrusive measure. In addition, this procedure does not rely on after-the-fact recall by students that may be inaccurate. The learning and memory model (Koran et al., 1983) and the framework developed by Koran and Koran (1986) provided the theoretical foundation for this study and a way to examine attention and learning in the museum and how they are affected by the characteristics of the visitors, characteristics of exhibits, and visitor processing activities. The photographs taken by students at the Florida Museum of Natural History provided physical evidence of how the students directed their attention while at the museum and illustrated significant differences in attention among the students.

There was a significant difference in the object or people orientation of the photographs with almost 87% of the photographs having an object orientation and 13% of the photographs having a people orientation. These photographs represent the products of attention and as such are suggestive of the learning that took place (Koran et al., 1983) while also illustrating the overwhelming importance of objects to museum visitors. Csikszentmihalyi and Hermanson (1995) suggest that "what information we select to attend to, and how intently, is still the most important question about learning" (p. 68). This significant object orientation also delineates a salient difference between formal and informal settings.

There was a significant difference in the exhibit hall topic, exhibit location, and exhibit type of the photographs. This is the result of the learning conditions in this informal setting being free choice and the students being able to move through the exhibits at their own pace, direct their attention as they wished, and decide what they wanted to photograph depending on how they interpreted the task description. The characteristics of the exhibits, including topic, location, type, size of object, whether alive, and the inherent drama and interest of the exhibit, were important factors and influenced attention.

There was no significant difference in the relationship between first-time visit/repeat visit and the object/people orientation.

When a variety of student characteristics, including gender, race, SES, general achievement, science achievement, and interest in science, were investigated to determine if any of them had an effect on whether attention was focused on objects or people, two variables were found to be statistically significant. African American students were more likely to take people photographs than White students while reduced lunch status students were less likely to take people photographs than students who received no lunch assistance. The people orientation illustrates the importance of the social aspects of the museum visit and how the characteristics of visitors influence what happens during the visit (McManus, 1988; Ogbu, 1995; Shade, 1982; Silverman, 1995) and therefore must be considered by any informal institution developing exhibits and programs. This people orientation may mean that for some members of the audience to be equal recipients of the object-rich informal settings, it may be critical to provide a link between the person and the object in both exhibits and programs. Bransford and Vye (1989) describe the importance of knowing the knowledge, expectations, and strategies of learners so that learning situations may be designed that take advantage of and utilize these characteristics.

It may mean that the social aspects of informal settings may be more important in drawing some visitors to the institution than the particular objects the institution contains. Incorporating these considerations into exhibits and programs may help more visitors become equal recipients of the educational opportunities that objects and exhibits provide in informal settings and also provide a first small step in changing the leisure traditions of African Americans that Falk (1993a) suggests will take time to change.

Suggestions for Further Research

Additional research could explore how the photographs taken by students might vary as a function of the task instructions given as suggested by Cherem and Driver (1983). Future research also should examine the photographs not only in terms of their content, which can be determined by examining the photographs themselves or the student descriptions, but also why the students took these particular photographs and what they mean to them. Studies of this nature could be designed as well to examine the impact of the museum visit longitudinally. Because objects within the museum represent both concrete and abstract concepts, another line of research could explore how different conceptual frameworks influence what is learned and which learning strategies and process skills are most effective for learners to use in informal settings and what kinds of training programs are most effective for teaching these strategies and skills. In addition, the transfer of object learning strategies and process skills from informal settings to both formal settings and daily life could be explored, therefore contributing important outcomes from this line of inquiry.

APPENDIX A
PILOT STUDIES

Study 1 -

As part of the summative evaluation of the Fossil Study Center exhibit at the Florida Museum of Natural History in fall, 1992, photography was used as a way of examining how visitors directed their attention within the exhibit. This 1800-square-foot, specimen-rich exhibit contains both articulated skeletons and individual specimens from the museum's extensive paleontological collections as well as models. A systematic space sample of visitors was selected and asked to photograph the three things they liked best in the exhibit. Participants were given a 24-exposure, one-time-use flash camera to use and explained its operation.

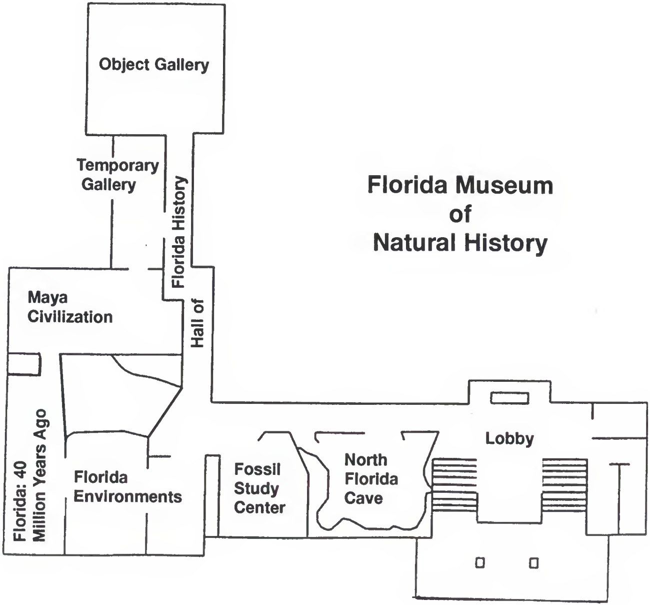
Fourteen different exhibits or parts of exhibits were photographed by the participants. The results illustrated the variability of visitor attention and provided evidence that large objects and dynamic exhibits attract more attention. Twenty out of the 24 photographs were of objects, with the smallest object being a whale skull, and none of the photographs included people in them. Three of the photographs were of computers and one was of a panel containing text, photographs, and graphics.

This pilot demonstrated the feasibility of using one-time-use flash cameras as a data-gathering research tool and indicated logistical considerations that would have to be taken into account.

Study 2 -

A pilot study in spring, 1996, was conducted to assess any problems associated with the study task description, student worksheet, or operation of the one-time-use flash cameras by adolescents. The subjects were 8 sixth, seventh, or eighth grade students who came to the museum with adults; these adolescents were not part of a school group. They were given the task, how to complete the worksheet was explained, and the operation of the cameras was described. These students were able to follow the task and had no problems using the cameras. However, they did need more room on the worksheet to write the descriptions of their photographs and the worksheet was modified accordingly.

APPENDIX B
FLORIDA MUSEUM OF NATURAL HISTORY FLOOR PLAN



Florida Museum of Natural History

APPENDIX C
INFORMED CONSENT FORM
(Approved by the University of Florida Institutional Review Board)

Betty Dunckel Camp
Dept. of Instruction and Curriculum, 258 Norman Hall
University of Florida

April 1, 1996

Dear Parents/Guardians:

I am a graduate student in the College of Education at the University of Florida. As part of my dissertation research, I am conducting a study to investigate how adolescent visitors in a natural history museum direct their attention. Participants in this study will visit the Florida Museum of Natural History on the University of Florida campus where I will give them instructions for a task that involves taking photographs in the exhibits. Students will be given a copy of the photographs they take. I will instruct the students on camera use during school, prior to the field trip. Findings from this study will have implications for exhibit development and design that will help make exhibits more educationally effective for all museum visitors.

I am asking you to permit your child to participate in my doctoral research. It is anticipated that there will be no risks in taking part in this study. Benefits include a field trip to the largest natural history museum in the Southeast with your child's team of teachers and students. This is a voluntary study, so you may withdraw your child from the study at any time without penalty or prejudice to you or to your child. It is preferable, however, that he/she takes part in the entire study. Participation or nonparticipation in this study will not directly affect his/her grade in any classes. Students who do not wish to participate in the field trip will remain at school.

Students will be transported from Lincoln Middle School to the Florida Museum of Natural History and back to Lincoln by school bus on Monday, April 22, 1996. The Lincoln teachers will also have field trip activities planned for the students. There are no transportation or participation costs for this field trip. During the museum visit, participants will be asked to complete a student worksheet. In addition, I also would like to have your permission to get, from the Alachua County School Board, your child's California Achievement Test (CAT) scores, mid-year science class grade, gender, race, and whether or not he/she qualified for federally subsidized lunches. All information will be numerically coded and completely confidential. No student names will be used in reporting the study findings. The list with names and numerical codes will be destroyed at the end of the study.

If you have any concerns at any time during the study, please call me at the Florida Museum of Natural History (392-1721). Questions or concerns about research participants' rights can be directed to the UFIRB Office, PO Box 112250, University of Florida, Gainesville, FL 32611-2250.

Your help with my research is greatly appreciated. Please sign the permission slip at the bottom of this letter and return it to your child's teacher. Thank you for your cooperation.

Sincerely,

Betty Dunckel Camp

I have read the procedure described above and I voluntarily agree to allow my child, ______________________________, to participate in Betty Dunckel Camp's study at the Florida Museum of Natural History.

SIGNATURES:

______________________________ ______________________________
Parent/Guardian Date Parent/Guardian Date

APPENDIX D
FIELD TRIP SCHEDULE

Schedule:

	Blue Group	**Green Group**	**Gold Group**	**Red Group**
9:30	lobby - orientation	balcony activity	movie/ restrooms	movie/ restrooms
9:45	exhibits - activity	lobby - orientation	"	"
10:00	"	exhibits - activity	"	"
10:45	balcony activity	"	"	"
11:00	movie/restrooms	movie/restrooms	lobby - orientation	balcony activity
11:15	"	"	exhibits - task	lobby - orientation
11:30	"	"	"	exhibits - task
12:15	"	"	balcony activity	"
12:30	lunch	lunch	lunch	lunch

APPENDIX E
FLORIDA MUSEUM OF NATURAL HISTORY
STUDENT WORKSHEET

Name ________________________________ Homeroom Teacher ______________

Camera Number ___________

How would you rate your interest in science?
____ very high ____ high ____ neutral ____ low ____ very low

Have you visited the Florida Museum of Natural History before? ____ yes ____ no

Picture #	Description
________	____ ____
________	____ ____
________	____ ____
________	____ ____
________	____ ____
________	____ ____

APPENDIX F
ACTIVITY DESCRIPTION

Pretend you are writing to a pen pal whom you have never met. In your letter you want to describe your visit to the Florida Museum of Natural History. You decide that it would help to include a series of photographs. That is what you will be doing today. You will be taking 6 photographs in the museum that you would send in your letter. Please write on the worksheet a description of each of the 6 pictures you take.

* Activity description modified from procedure described by Damico (1985).

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BIOGRAPHICAL SKETCH

Betty Dunckel Camp was born in 1950 and grew up in upstate New York. She received her Bachelor of Science degree from Cornell University in 1972 and her Master of Arts in Teaching degree from the University of New Hampshire in 1973. While in graduate school, Ms. Camp taught sixth and seventh grade science and worked at resident environmental education schools in New Hampshire and Maine where she discovered her love for informal settings. Ms. Camp worked at the Jacksonville Children's Museum (now the Jacksonville Museum of Science and History) in Jacksonville, Florida, from October, 1973, through August, 1977, first as the Natural Science Curator and later as the Science Curator. She has been at the Florida Museum of Natural History in Gainesville since September, 1977, where she has had the opportunity to develop and implement a wide range of educational programs. Since 1990, she has also worked with exhibit development and more recently has been able to pursue her interest in research and evaluation. Ms. Camp resides with her husband, Steve, and children, Andrew and Rebecca, in Gainesville, Florida.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

John J Koran Jr
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